Rush-Presbyterian-St. Luke's Medical Center

The Magazine

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n this issue:

- Rebuilders of the Body
- In Vitro Fertilization
- Epilepsy Treatment and Research
- Psychiatry in Thailand

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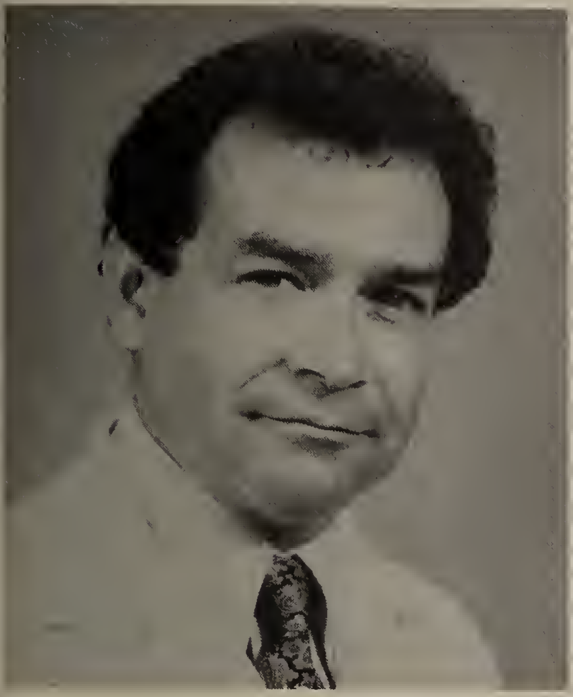
HENIKOFF NAMED PRESIDENT OF RUSH-PRESBYTERIAN-ST. LUKE'S MEDICAL CENTER



Leo M. Henikoff, M.D.

Leo M. Henikoff, M.D., was elected a Trustee and president of Rush-Presbyterian-St. Luke's Medical Center at a special meeting of the Board of Trustees on April 11, 1984.

Dr. Henikoff, who has been dean and vice president of medical affairs of Temple University School of Medicine, where he also is professor of medicine, assumes office on July 1st. He succeeds James A. Campbell, M.D., who retired in September, 1983 after serving as president for 19 years. Dr. Campbell died on November 19, 1983 (see page 36).

Dr. Henikoff's election was announced by Harold Byron Smith, Jr., chairman of the Board of Trustees, who said: "Great social, economic and cultural forces are substantially altering the art and science of health care. Our challenge has been to find a new chief executive officer who not only understands these forces but has the leadership to navigate the rocks and shoals of major health issues, keeping the Medical Center on its steady, broad course of excellence.

"We have sought a person of impeccable professional credentials and demonstrated managerial talent reinforced by personal characteristics of understanding, compassion, imagination and integrity. We have found that person is Dr. Leo Henikoff," Smith said.

Noting that Dr. Henikoff first had been associated with the Medical Center in 1963, Smith said "In the past 21 years, we, and Dr. Henikoff, have watched the progression from an excellent teaching hospital to an academic medical center of national renown. All of the indices we have used to measure our progress over a full generation have been directly observed and, in some cases, been influenced by Dr. Henikoff."

Smith served as chairman of the presidential search committee which also included Roger E. Anderson and Richard L. Thomas, vice chairmen of the Trustees; Joseph J. Muenster, M.D., past president of the medical staff; and Henry Gewurz, M.D., the Thomas J. Coogan, Sr., M.D., professor of immunology and chairman of the Department of Immunology/Microbiology.

Born in 1939, Dr. Henikoff was graduated with highest honors in 1963 from the University of Illinois College of Medicine where he was recipient of numerous academic awards. He was valedictorian of his class and elected to Alpha Omega Alpha, the national medical honors society. He came to the Medical Center in 1963, following graduation, as an intern in pediatrics. Upon completion of his residency at Presbyterian-St. Luke's Hospital, he served as a clinical instructor at the University of Illinois College of Medicine and at the Georgetown University Medical School.

He returned to Rush in 1969, and served as acting dean and associate professor in Rush Medical College. In 1977, he was named the outstanding teacher by the students who voted him the Phoenix Award. He also was the senior attending physician at Presbyterian-St. Luke's Hospital before leaving for Temple in 1979. In the year before his departure, he served as vice president for interinstitutional affairs.

Dr. Henikoff's appointments as professor of medicine in Rush Medical College and senior attending physician at Presbyterian-St. Luke's Hospital will take place at early meetings of the appropriate faculty and medical staff bodies.

Dr. Henikoff and his wife, Arlene, have two children.

The search committee was assisted by a national advisory committee whose members were: William G. Anlyan, M.D., chancellor for health affairs, Duke University; Robert J. Glaser, M.D., former president of the Henry J. Kaiser Family Foundation; and James F. Glenn, M.D., president, the Mount Sinai Medical Center, New York.

Representing the advisory committee, Dr. Glenn read messages to the Trustees from the other members. Dr. Anlyan wrote: "The nation salutes the Trustees of Rush-Presbyterian-St. Luke's Medical Center for having conducted a national and international search to find a worthy successor to Jim Campbell. It is of certainty that Leo Henikoff will be an outstanding leader for the next generation. In national meetings, I have been extremely impressed with his wisdom, intelligence, humor and hard work. You have a real winner. Congratulations to Rush-Presbyterian-St. Luke's for attracting a key leader who will continue to steer the institution in its path of excellence."

Dr. Glaser's message said, in part: "The Medical Center enjoys an excellent reputation not only in its own geographic area but nationally as well. The board has provided exemplary support to the Center's program, and all of you can be justly proud of the Center's stature. What is especially important is the obvious interest exhibited by all of you in striving constantly to move with changing times and to remain in the forefront of education, patient care, and research.

"I'm delighted that you have selected Leo to head the Medical Center. I have had the privilege of knowing Leo since his earlier days in Chicago, and have the greatest respect and admiration for him professionally as well as personally. He brings to his new post broad experience in academic administration, and a keen appreciation of excellence. He is devoted to the Rush-Presbyterian-St. Luke's Medical Center, And I have every confidence he will be a superb leader for the enterprise...."

Dr. Glenn's remarks touched on a number of health-related issues. "Medical education," he said, "will change drastically in the next decade as it becomes more intellectual. We will open new frontiers in molecular biology and genetic engineering, in immunology, in the fundamentals of the life of the human cell—things that were not even imagined when I was a medical student or when Leo was a medical student. As we change that focus of education, we must also change our patterns of health care delivery.... Perhaps the biggest challenge will be to retain humanism in medical care delivery in the face of the tremendous technology we have available to us."

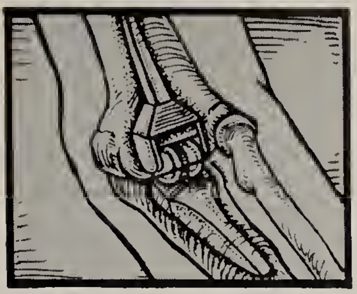
Harold Byron Smith, Jr., chairman, Board of Trustees, (3rd from left) and Dr. Henikoff, (center), are flanked by past chairmen (left to right) Albert B. Dick III, Edward F. Blettner, John P. Bent, George B. Young, and Edward McCormick Blair at special meeting of the Trustees.

Folowing a unanimous vote and standing ovation, the president-elect briefly recounted the history of the Medical Center, giving special emphasis to developments of the past three decades so that it is today a "major medical center on the national scene in a leadership position in many of its attributes and delivering the kind of care that is really second to none."

Looking ahead to the 80s, Dr. Henikoff said that for development to continue "We have to learn to be more efficient. We already are very effective. The financial demands of the market place demand that we be more efficient in health care delivery.

"We have to find new ways to keep people healthy, to cure their illnesses while minimizing the use of expensive resources. We also have to pay particular attention to our science and to our education. What I see the 80s and the 90s bringing to this institution is a position on the national scene that evolves from growth in all three areas of our endeavors.

"The new health care environment is clearly a competitive one, and, in my estimation has been thrust upon us without proper controls of quality. The legislation which has put this competitive environment into place has not given appropriate consideration to the quality of care the population will receive. We have a role, particularly at Rush-Presbyterian-St. Luke's, to be the champions of quality in a system that does not demand quality as much as it used to. If, in this new era of 'marketing' we are to market a product, this institution should market excellence because that is what we stand for.... We must continue the kind of forward thinking that, in the future, will make this institution even better than it is today."



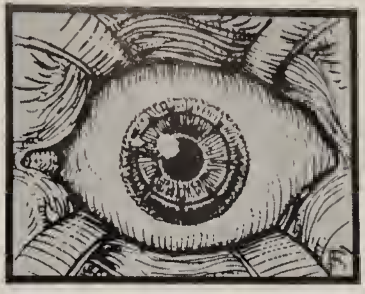


Table of Contents

REBUILDERS OF THE BODY (I) .... Janice Perrone
Advances in orthopedic surgery using artificial and cadaver parts 3

REBUILDERS OF THE BODY (II)
An overview of reconstruction techniques in several Medical Center departments 17

RUSH'S "BIONIC WOMAN"
Introducing a patient with many artificial joints 15

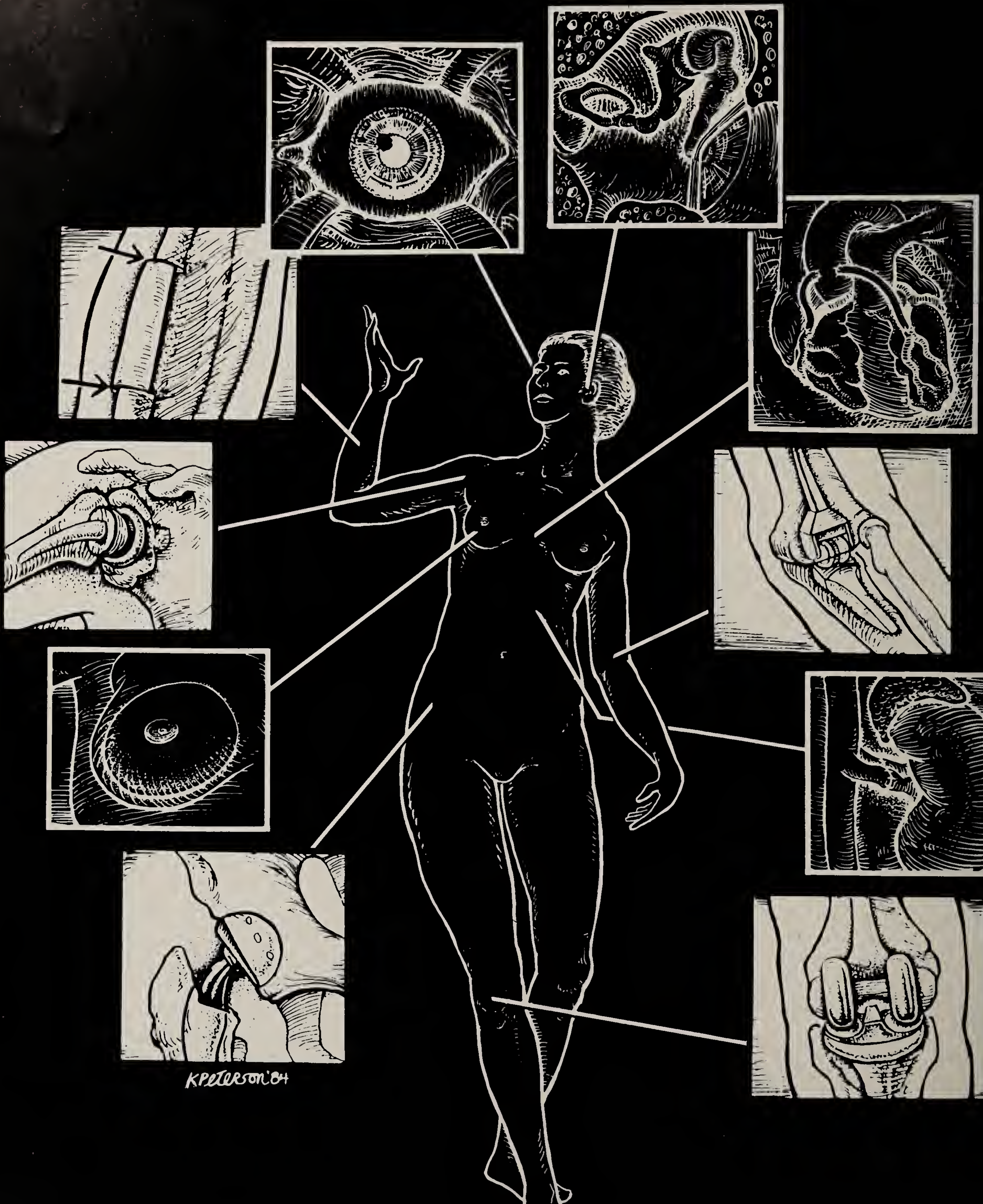
N VITRO FERTILIZATION .... Francie Murphy
The process of achieving conception outside the womb 21

EPILEPSY TREATMENT AND RESEARCH .... Janis Long Harris
New research and surgery bring new hope for epileptics 27

PSYCHIATRY IN THAILAND .... Krys Kaziezcko-Kuszak
Impressions of a Rush Medical College student 32

RUSH ROUNDS
Newsbriefs from the departments 36

n the cover: Time sequence photo of sub-
ct in the Medical Center's Gait Analysis
aboratory of the John L. and Beatrice
eeshin Human Motion Research Labor-
tory while researchers measure the
nctional biomechanics of the leg during
air climbing.


KPeterson'84

Rebuilders of the Body

I

Orthopedic Surgeons Replace Bones, Joints, and Ligaments to Ease Pain, Restore Function

By Janice Perrone

In 1973, Edward M. Kennedy, Jr., then 12 years old, developed a malignant tumor on his lower right leg. To save his life the leg was amputated above the knee.

In the last decade, dramatic improvements have been made in orthopedic treatment and research. New surgical techniques to replace bones, elbows, hips, knees, toes, fingers, wrists, shoulders, and ligaments have made possible the reconstruction of bodies crippled by cancer, arthritis, and athletic injuries. Today, millions of people have one or more artificial joints. Artificial hips were developed in the late 60s, knees in the early 70s, elbows a few years later, and wrists by the late 70s. Since the early 70's, a technique to replace tumorous bones, allografting, has been perfected; Dr. Henry Mankin, a Boston surgeon and leading authority on allografting, believes young Kennedy might have been a candidate for the procedure.

The explosion in orthopedic advances in the last few years is reflected in the total number of patients treated by Rush-Presbyterian-St. Luke's Medical Center's Department of Orthopedic Surgery. Today the Medical Center's orthopedic staff sees more than 25,000 outpatients and performs 2,300 major surgical procedures—more than double the number of just five years ago. They can diagnose and treat almost every kind of musculoskeletal disorder, allowing them virtually to "rebuild the body."

Replacing Bones

Allografting is a method of salvaging a patient's limb by replacing a tumorous bone with a human cadaver bone. Tumorous bones may also be replaced with the patient's own bone (an autograft) or with a piece of metal. The location of the tumor usually determines which method is used, but each limb salvation technique has advantages and drawbacks.

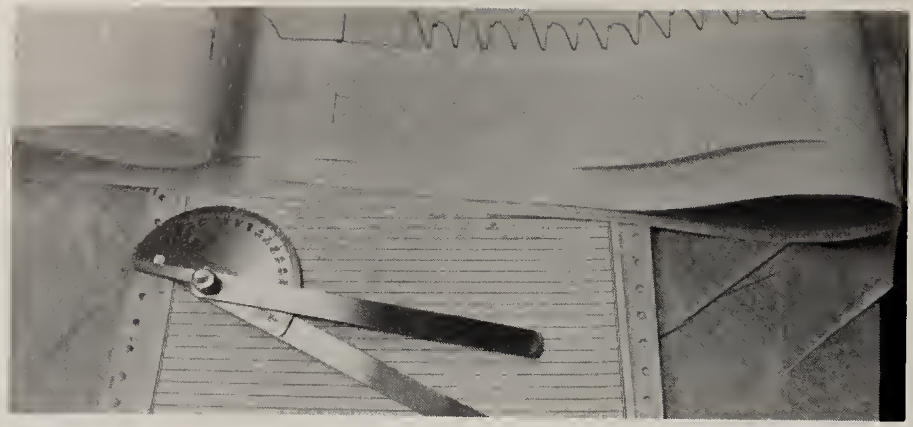
One advantage of an allograft is that it's a biological implant rather than an artificial one. "This means I can reattach tendons and ligaments to it making functional return in the limb far better than it would be with a metal implant," says Steven Gitelis, M.D., assistant professor, Department of Orthopedic Surgery.

Bone also has special regenerative properties. Over a period of about two years, the cadaver bone acts as a support while the patient's own bone grows. Tissue with a blood supply grows into the allograft; the new living bone creeps up on the dead bone, resorbs it, then finally replaces it. The revascularization is very similar to the healing process of a broken bone. "When you break your leg," says Dr. Gitelis, "bone regeneration takes place at the junction between the two ends of the bone. The same thing happens with a bone transplant."

Replacing the tumorous bone by autograft rather than allograft would completely eliminate the possibility of the patient's body rejecting the donor bone. Also, since the implant would be living rather than dead tissue, the bone would heal much faster. But an autograft would necessitate an additional surgery to remove some of the patient's bone, and because a lot may need to be cut out in order to remove all the cancer, patients often don't have enough bone available for transplanting.

Allografts have been most successful in non-weight bearing bones such as the shoulder, forearm, wrist, and elbow. They are also highly successful when the tumorous segment being replaced is in

llustration on facing page and page 16 hows some of the many artificial, living and adaver materials used by physicians at ush-Presbyterian-St. Luke's Medical enter to "rebuild the body." Highlighted ere and discussed in the following article re an elbow joint, knee joint, hip joint, houlder joint and bone implant.



Steven Gitelis, M.D., heads Medical Center's bone bank, which makes available cadaver bones for implantation surgery.

the center of a bone, even if the bone is in a weight-bearing area. This is because the creeping substitution of living cells can then occur from both directions. Another good location for allografts is the knee joint, a common location for tumors. If it is possible to remove only the half of the knee joint with the tumor and leave in the other half, the allograft will revascularize very rapidly because the particular knee bone involved, the cancellous bone, is a quick-healer.

But if the tumorous bone is in a weight-bearing area and the cancer is not in a center slice, the implanted cadaver bone generally crumbles before new bone has a chance to grow in. In these cases, metal implants can be used. Successfully implanting metal is also a recent phenomena, due in part to improvements in metallurgy. "Implanting metal became feasible because of the strength of the materials we can use today and because of the fact that the human body became increasingly more able to tolerate the metals as they became more inert," says Dr. Gitelis. He estimates that about 25 percent of his patients have autografts and the remaining 75 percent are evenly divided between allografts and metal implants.

A major drawback of metal implants is that they usually require cement fixation, and, after years of wear, the metal may loosen and the implant may need to be recemented. Because cement erodes bone, leaving nothing for the implant to cling to, replacement eventually becomes impossible. Metal implants, therefore, are not for patients who have a lifetime ahead of them.

Unfortunately, bone cancer usually affects young people between the ages of 10 and 20. In the last few years, allografts have saved the limbs of several hundred people in the U.S., many of them teenagers and young adults. Dr. Gitelis has been performing allografts at the Medical Center for almost three years, and he currently performs about ten percent of all the cadaver bone transplants done in this country. The success rate is leading to an increase in popularity of this technique which was first performed around the turn of the century.

A surgeon named Erich Lexer, practicing in Germany, performed the first cadaver bone transplant on a cancer patient in 1908. Over the next six decades, allografts were used intermittently with varying success. Problems associated with them included rejection and fracture of the bone transplant. But in the early 1970s, Dr. Mankin discovered how to perfect the technique. "He showed that if we fix the bones rigidly with metal plates and screws, not only won't the implants break but they heal quite nicely," says Dr. Gitelis. It was also discovered that if cadaver bones are frozen before being implanted, rejection is minimal to non-existent.

Dr. Gitelis learned limb salvation techniques during a one-year fellowship at the Mayo Clinic and Bologna's Institute Ortopedico Rizzoli. In addition to initiating allografting at the Medical Center, he also heads the Chicago area's only bone bank, which procures and stores bones

"When you break your leg, bone regeneration takes place at the junction between the two ends of the bone. The same thing happens with a bone transplant."

Steven Gitelis, M.D.

Glenn C. Landon, M.D., (left) and Jorge O. Galante, M.D., in corridor of Medical Center's operating suite, where special laminar flow equipment aids joint replacement surgery.

or allografts much as a blood bank olicits and stores blood for ransfusions.

Bones are harvested for the bone ank at the same time organs are rocured for transplants. When a atient at one of the 39 hospitals in he Medical Center's Organ and Tisue Recovery Program is declared rain dead and the family has conented to the donation, bones are arvested by Dr. Gitelis and an orhopedic surgery resident. The resient is on call seven days a week, 4 hours a day in case a donor beomes available, and each of the 15 onors per year provides multiple ones in all shapes and sizes for he bone bank. The bones are tored in a 17-cubic-foot capacity reezer at minus 80 degrees centirade; this not only kills the bones o they won't incite an immunologcal response when implanted, it lso allows them to be stored for ndefinite periods of time. These ones are available not only to surgeons at Rush-Presbyterian-St. Luke's Medical Center, but to other orthopedic surgeons throughout the country who perform allografts.

The cadaver bone implantation process begins with the removal of the tumorous segment. This often leaves a large portion of bone and sometimes joint missing. Like fitting together puzzle pieces, Dr. Gitelis picks a bone from the bone bank that matches the piece of bone being removed. This selection is usually done a few days prior to surgery after looking at x-rays of the affected bone. On the date of the surgery, the bone is taken out of the freezer, unwrapped, put in a room temperature solution of Lactated Ringers and thawed. Because it's important to hold the cadaver bone rigidly in place, Dr. Gitelis fixes it to the host bone with many plates and screws. He then makes holes in the allograft and reattaches all the tendons in the soft tissue around the bone to the implant with sutures.

After two years, the new bone should be completely formed and virtually indistinguishable from a healed fractured bone . At this time, the patient should be able to do almost any physical activity, even contact sports. "One of my patients, Michael Curtin, was a local high school football star," says Dr. Gitelis. "We did a cadaver bone transplant in Michael's right arm two years ago, and he now has virtually normal function. He played the entire football season last fall and may even go to college on an athletic scholarship."

Unfortunately, limb amputation is still the standard treatment for a patient with Michael's type of tumor, but, thankfully, bone tumors are rare. There are no more than 3,000 malignant bone tumors in America each year. Dr. Gitelis, therefore, believes that cadaver transplants may have their greatest impact in the future treatment of arthritis victims. More than 30 million Americans have some form of arthritis, but the two most common types are osteoarthritis and rheumatoid arthritis. Osteoarthritis is the result of joints "wearing out." It usually affects, to some degree, the weight-bearing joints of all adults by late middle age. Rheumatoid arthritis affects children and great grandparents alike, with twice as many women as men as its victims. While rheumatoid arthritis causes more progressive damage to joints throughout the body, both types may necessitate joint replacement surgery.

"Today millions of Americans

have joint replacements made of metal," says Dr. Gitelis. "In ten years, cadaver transplants may prove to be state-of-the-art in arthritis treatment." (See article on the Medical Center's new Arthritis Center on page 44.)

Replacing Joints

Most researchers and physicians agree that in ten years biological replacement or transplant of joints may play a more important role in what treatments can be offered to arthritis patients. "There is no material that is *functionally* better in the human body than another human part," says Jules S. Shapiro, M.D., assistant professor, Department of Orthopedic Surgery. "In the long run, cadaver joint replacements are going to be much more the answer than what we are doing today. What we're doing right now are not joint *replacements* but substitutions. We're substituting metal and plastic for bone and cartilage. A true joint replacement will be when we take out damaged bone and cartilage and replace it with undamaged bone and cartilage, and the only source for these replacements will be allografts."

Dr. Shapiro, who implanted the world's first artificial shoulder joint in Norway in 1969, says that Dr. Gitelis' work serves the dual purpose of salvaging limbs for cancer patients as well as providing experience with the techniques and immunological considerations of cadaver transplants.

"Immunological problems are the major stumbling block to cadaver joint transplants," Dr. Gitelis says. "Unlike bone transplants for cancer patients, joint transplants for arthritics require living bone, not frozen bone; and we are only now beginning to solve the immunological problems of implanting fresh bone."

Another promising area for the biological replacement of joints is regeneration of an arthritic's own cartilage. But, for this to happen, scientists have more to discover about the basics of cartilage regulation and control. In conjunction with the Department of Biochemistry, the Department of Orthopedic Surgery is conducting research studies on proteoglycan chemistry in cartilage.

Cartilage is to bone what a shock absorber is to a car. By cushioning the ends of bones, cartilage allows them to endure the repeated pounding of walking and weight-bearing. Cartilage functions as it does because of its composition. It has just a few cells (chondrocytes) but much material outside the cells (extracellular matrix). It's the matrix that gives the cartilage the resi iency it needs to function, but it the chondrocytes that are respons ble for the synthesis and mainte nance of the extracellular matrix.

James Kimura, Ph.D., associat professor, Departments of Orthope dic Surgery and Biochemistry, ha been studying how the matrix i assembled. "Damaged cartilage re pairs itself to a limited extent," say Dr. Kimura. "However, these repair are not usually permanent. If w understood what processes are i volved in assembling and maintain ing the matrix, we might be able t help chondrocytes make repairs and if we could stimulate appropri ate repairs in the cartilage of arthrit ics, then it would not be necessar to replace their joints."

But biological solutions like thes are years away, and to arthritics wh can't manipulate shoelaces wit gnarled, frozen fingers or stand th pain of raising an arm to comb thei hair, artificial joint replacement

Margaret Maley, R.N., instructs patient on care of artificial joint.

> *"The likelihood that a cemented prosthesis will fail nowadays is much lower than it was ten years ago. We've learned how to use cement, how to apply it in a much different manner and there have been a lot of advances in the engineering design."*
>
> **Jorge O. Galante, M.D.**

have been a miracle.

"The goals of joint replacement surgery," says William F. Hejna, M.D., professor, Department of Orthopedic Surgery, "are to relieve pain, improve motion and eliminate deformities the patient may have—for example, lengthening a limb that is too short. A surgical candidate is someone who hasn't responded to medication, physical therapy or using assisting devices such as a cane. The patient frequently finds it difficult to work or sleep because of the pain."

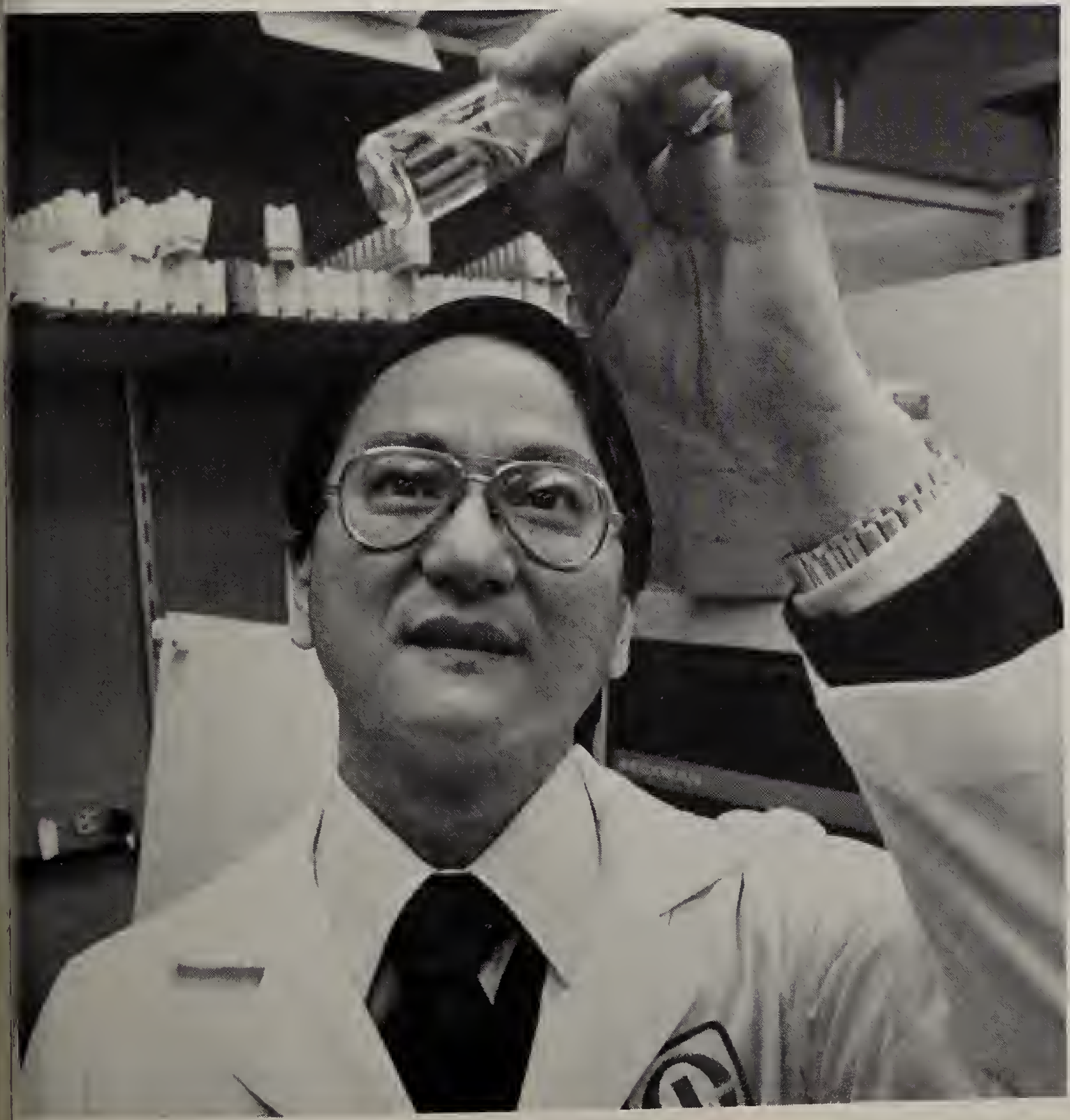
About 95 percent of patients who have joint implants are relieved of their pain, and most also have enough increased mobility to take care of their daily needs.

Credit for modern joint replacements goes to the late Sir John Charnley of England, who, in the 1960s, pioneered successful hip joint replacements. He developed a device made of metals and plastics that don't corrode or generate friction and are generally compatible with the body environment. The artificial joint was glued in the bone with a quick-drying, acrylic cement called methyl methacrylate, a substance used by dentists to anchor crowns and bridges. Total hip replacement surgery in this country began in the late 60s, and, in 1968, Jorge O. Galante, M.D., professor and chairman, Department of Orthopedic Surgery, was one of the first physicians in Chicago to perform a total hip implant.

The majority of joint replacements are of the weight-bearing joints—the hip and knee, and, currently, Medical Center surgeons perform more hip and knee joint replacements than are done at any other institution in Chicago. But rheumatoid arthritis affects all joints in the body, and today surgeons can also implant artificial shoulders, wrists, fingers, toes, and ankles. More than 400 joint replacement surgeries are performed at the Medical Center annually, and patients from all over the United States are referred here for these procedures.

While joint replacements were a "miracle" for thousands of arthritis victims, they were not without fault. Because the cement that fixes the prosthesis to bone is a brittle material, the bond weakens in a certain percentage of patients who are young, very heavy, or very active. Like fillings falling out of teeth, the artificial material loosens from the bone and movement is painful for the patient, necessitating revision surgery to re-cement the joint.

Fifteen percent of the Department of Orthopedic Surgery's overall procedures is revision surgery for patients from all over the country whose implants have failed. This area of orthopedics was identified by the American Academy of Orthopedic Surgeons as one which should be investigated in an attempt



Research studies, such as those of James Kimura, Ph.D., may eventually produce ways to stimulate cartilage repair in arthritics.

William F. Hejna, M.D., (right) examines an x-ray in the operating room.

to decrease the staggering number of failed implants. Surgeons found that some devices began to fail five to ten years after implantation, but, like bone cancer patients with metal implants, arthritis patients cannot have their metal prosthesis re-cemented every few years. Surgeons became reluctant to implant artificial joints in any but elderly patients.

"We had to come up with some solution for younger patients," says Dr. Galante. "You can't just save these procedures for people who are in their late 70s. I had patients who were in their 40s, sometimes even very young patients, who had joints completely destroyed by arthritis. We'd basically have to tell them that they weren't old enough yet for relief, that they had to wait, live with chronic pain and immobility, and waste the best years of their lives."

The "solution," cementless prosthesis, is today becoming a reality. Years ago it became clear that if the surface of the artificial joint was porous instead of smooth, the bone would grow into the surface and hold the prosthesis in place, creating a strong, durable bond. As early as 1970, clinicians and researchers at the Medical Center, in conjunction with William Rostoker, Ph.D., professor of metallurgy at the University of Illinois, began working on a porous material for fixation. Together they created fiber metal, a space-age alloy made from titanium. This porous alloy was implanted in a large population of baboons and studied by Medical Center researchers for ten years.

"The material was durable and well-tolerated in the animals," says Dr. Galante. "There was no evidence of tissue or general toxicity."

"It was so effective experimentally," adds Dr. Gitelis, "that in 1976 oncologists began using titanium implants to replace segments of bone after tumor surgery." Medical Center surgeons have now implanted 26 tumor prostheses made of fiber metal for cancer patients.

The first cementless hip joint replacement for an arthritis patient at the Medical Center came in 1981 as part of a full human clinical trial of fiber metal under Food and Drug Administration review. To date, 126 cementless hip joints have been implanted in patients aged 17-73; about 50 cementless knees and even two cementless elbows have been implanted. In addition, a large percentage of the revision surgery performed here gives patients a cementless implant in exchange for their failed cemented one.

"As time goes on, cementless devices become an intrinsic part of the patient's skeleton," says Dr. Galante. "The patient puts weight and therefore stress on the bone that grows into the implant, and the bone responds by becoming very strong. Strong enough, we hope, to hold the prosthesis for a lifetime."

In the short-term, patients with cementless implants are doing at least as well as those with cemented ones. But time is the critical test for these devices, so it may be many years before a final verdict is reached on how long cementless implants can last in humans and how much stress they can endure. In the meantime, the implants are being continually evaluated; in particular, the materials that comprise the implants are under study. Fiber metal is a relatively new material, currently available at only two other medical centers in the United States. Several other institutions will soon begin utilizing it, however, as part of an FDA study.

Cementless devices are also made from cobalt chromium alloys. "But porous cobalt implants have

"The difference between a knee prosthesis today and its counterpart in 1971 is equivalent to comparing a Ferrari to a Model-T Ford."

Jules S. Shapiro, M.D.

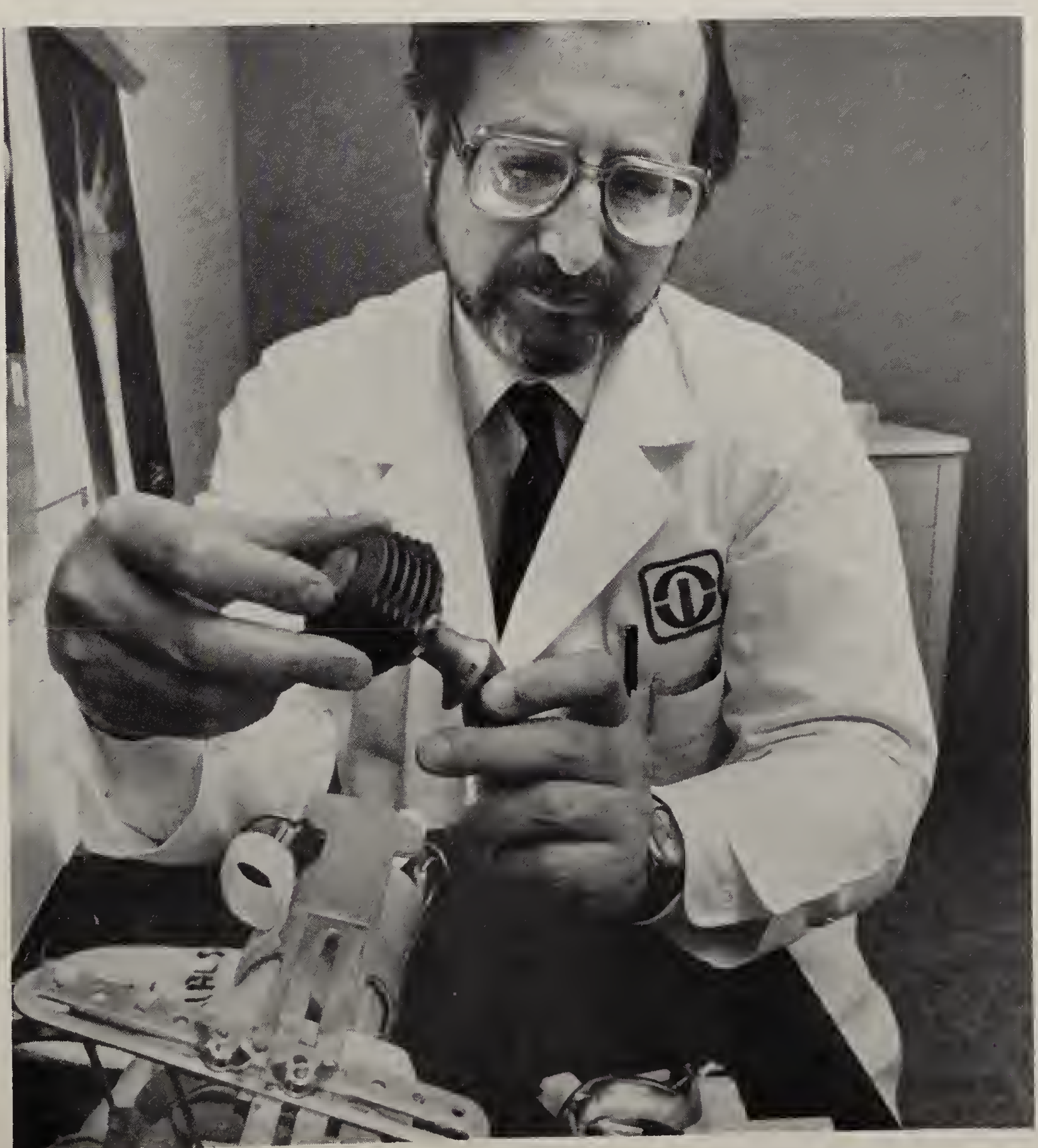
not been studied in animals for as long as fiber metal has," says Dr. Galante, "and, based on our research, we feel that titanium is the safest and most biocompatible material."

Even if cementless prostheses are still serving patients without problems many years from now, Dr. Galante does not expect the new method to make dinosaurs of cemented prostheses. "I think there will always be a large segment of the population where cement is the best choice for fixation," he said. "There is usually no need to do a cementless prosthesis on patients in their 70s. Activity levels and years of need are low in the aged patient, so the cemented prosthesis holds very well for them. It's also time-tested and the rehabilitation period is much shorter than with the cementless device."

Because it takes time for the bone to grow into the implant, a patient with a cementless prosthesis must protect the new joint from too much weight for about three months. During the first six weeks, patients with cementless hip joints must use crutches and limit the amount of weight they put on their leg. For the next six weeks, patients can bear their full weight, but must continue to use crutches.

Acrylic cement, on the other hand, dries in six minutes, so it should be as firmly fixed on the day of surgery as it will be two years later. But whether the implant is cemented or cementless, patients with artificial joints are advised against engaging in many strenuous physical activities for the rest of their lives. For patients with artificial hip joints, these activities include tennis and other racket sports, running, jogging, and any other activity that puts a pounding or sharp twisting motion on the joint. They should also restrict the amount of weight they lift and maintain a reasonable body weight to avoid putting excess stress on the hip. But artificial hips do allow arthritics to enjoy many sports, including swimming, bicycling, walking, and golf (as long as someone else carries the bag). Patients are also counseled that, with few restrictions, they can resume a normal sex life.

Margaret Maley, R.N., assists Dr. Galante and teaches patients how to care for their artificial joint. "Some younger patients have come here for cementless implants with the idea that the joints will be indestructible," says Maley. "They've been turned down for surgery elsewhere because they're so young, so they come here for the cementless procedure thinking they're not only eligible for surgery now but that the outcome will be that they can play tennis and do everything that someone who doesn't have arthritis can. I have to tell them that



A display of various prosthetic devices. Jules S. Shapiro, M.D., holds artificial hip joint.

their new joint won't be as good as the one God gave them, but it should allow them to do everyday activities without pain."

Patients also need to take steps to prevent infection for the rest of their lives. "When you implant a lot of foreign material," says Glenn C. Landon, M.D., assistant professor, Department of Orthopedic Surgery, "the body is much more susceptible to infection. Because the new joint is artificial and doesn't have the body's natural protection against infection, bacteria from a variety of sources can enter the blood stream and seed in the new joint." Although infection is not common or life-threatening, it is one of the major complications of joint replacement surgery and, like cement loosening, can cause the joint to fail.

Kevin Cronin, P.T., checks printout results of patient's workout on Cybex machine.

Infection can occur right after the operation or years afterward. When it occurs early, it may be due to "air contamination during the surgical procedure. That's why joint replacements are usually done in special operating rooms with laminar flow equipment," says Dr. Hejna. "A plexiglas room with electronically-filtered air encloses just the surgeon's and patient's body from the neck down. This lowers the infection rate due to bacteria in the air. It's a take-off on what NASA did trying to develop sterile air environments in space." The Medical Center built special orthopedic operating rooms in its new Atrium Building which provide a 99.9 percent sterile air environment. In addition, the walls in the suite are collapsible, allowing the rooms to be prepared in a matter of minutes for surgery that does not require laminar flow sterility.

When infection occurs years after the surgery, it is usually caused by bacteria in the bloodstream. Something as simple as getting teeth extracted can cause a release of germs into the blood. One of the most important infection prevention steps Maley recommends is that joint replacement patients take antibiotics before having any dental work.

In 1961 Dr. Charnley wrote, "neither surgeons nor engineers will ever make an artificial hip joint which will last thirty years and at some time in this period enable the patient to play football." Cementless implants may someday prove Dr. Charnley wrong on the first count, and physicians and researchers in the joint replacement field continue to strive for joints that will tolerate higher activity levels. Towards thi end, cemented techniques have been constantly improved.

"The likelihood that a cemented prosthesis will fail nowadays is much lower than it was ten years ago," says Dr. Galante. "We've learned how to use cement, how to apply it in a much different manner and there have been a lot of ad vances in the engineering design of the prosthesis."

Dr. Shapiro agrees that the functional return with artifical prostheses has markedly improved. "The difference between a knee prosthesis today and its counterpart in 197 when I did my first total knee replacement surgery is equivalent to comparing a Ferrari to a Model-T Ford."

The Gait Lab

The reason prosthesis design has changed and improved over the years is because of research studies like those at the Medical Center's Gait Analysis Laboratory in the John L. and Beatrice Keeshin Human Motion Research Laboratory. The gait lab is one of the nation's few sophisticated resources for analyzing the walking motions of the human body. The simple act of taking a step involves a complex distribution of forces on body parts. Scientists in the gait lab have been able to precisely describe this process using an opto-electronic method of measuring motion and computer technology to collect data.

"If you're going to do reconstructive surgery on joints, you have to know how the procedure and the implant affect joints and movement in patients," says Thomas P. Andriacchi, Ph.D., associate professor, Department of Orthopedic Surgery,

> *"The first step in figuring out what kind of fixative to use is to know where the stresses are in the joint in question."*
>
> **Thomas P. Andriacchi, Ph.D.**

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and director of the Section of Orthopedic Research. "Ultimately, how the patient functions with the prosthesis will tell you how good the procedure was, but just the subjective response by the patient is not enough. The gait lab allows us to quantitate the results in scientific studies."

An important study recently completed by gait lab staff should help make knee prosthesis designs even better in the future. About five years ago, biomechanical researchers began evaluating different designs of artificial knee prostheses in a study funded by the National Institutes of Health. They suspected that the functional difficulties knee replacement patients were having after surgery were caused by a design fault in the prosthesis.

Over a period of two years, 100 patients with different types of implants were brought to the human motion laboratory to be studied walking on level ground or climbing or descending stairs. Light emitting diodes (LEDS) were hooked up to each patient at points where bones are most prominent: the pelvis, hip, knee, ankle, heel, and base of foot. Cameras recorded the exact movement of the LEDS while the patient moved, relaying an image of each patient's gait onto a video display terminal. From that image, computers calculated the various angles of the flexed knee joint and the amount of mechanical force acting on the joint. By combining this data with patient comments about function, Dr. Andriacchi was able to identify a knee prosthesis design that allowed for the best active movement as well as those that hindered movement the most—and why.

"We found two characteristics that set the best design apart from the rest," he says. "These were the shape of the articulating surfaces (the parts of the joint that come in contact with one another) and the retention of the posterior cruciate ligament (connecting the back of the tibia, or calf bone, to the front of the femur, or thigh bone). It became clear that the artificial knees that sacrificed the posterior cruciate ligament and whose surfaces were not shaped like a normal knee placed an undue amount of strain on the patient's quadriceps muscle."

This muscle is located on the top of the femur, and the stress from a poorly-designed knee joint makes it work harder to raise and lower a patient's leg while climbing stairs. This additional stress on the quadriceps muscle puts a greater force than necessary back on the artificial knee and, potentially, on the cement bond of the joint as well.

This research, showing that the design of a total knee prosthesis can influence a patient's level of restored function and providing new criteria to be used to improve future designs, earned for Dr. Andriacchi and his coworkers the 1982 Kappa Delta Award, the most prestigious award in the field of orthopedics.

Dr. Andriacchi and his staff followed this study by researching artificial hip joints prostheses in exactly the same manner that knees had been studied. They found that patients who have a hip prosthesis called a surface replacement hip don't walk normally. They reasoned this is because the design unnecessarily stresses the bone and the cement that adheres the prosthesis to bone, and that patients, feeling this stress in a subliminal way, modify their walking to try to accommodate it. Dr. Andriacchi hopes to continue the study and prove this hypothesis.

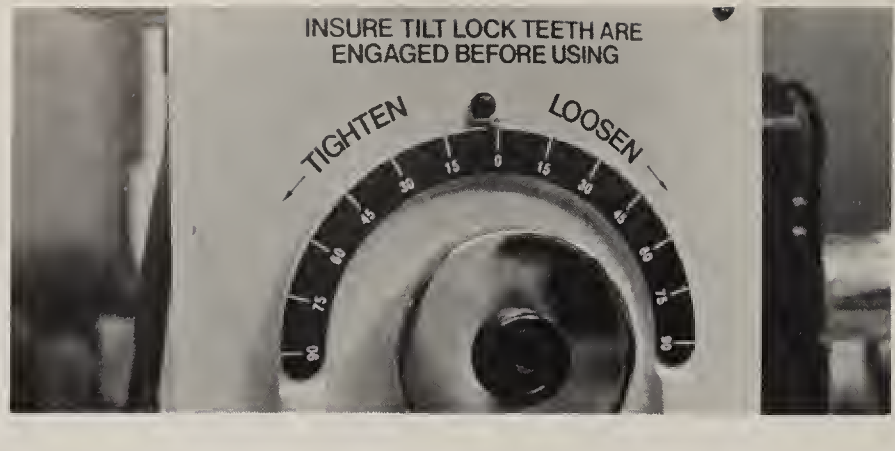
In addition to evaluating prosthetic design, laboratory researchers also do stress analysis tests of the materials that make up orthopedic implants.

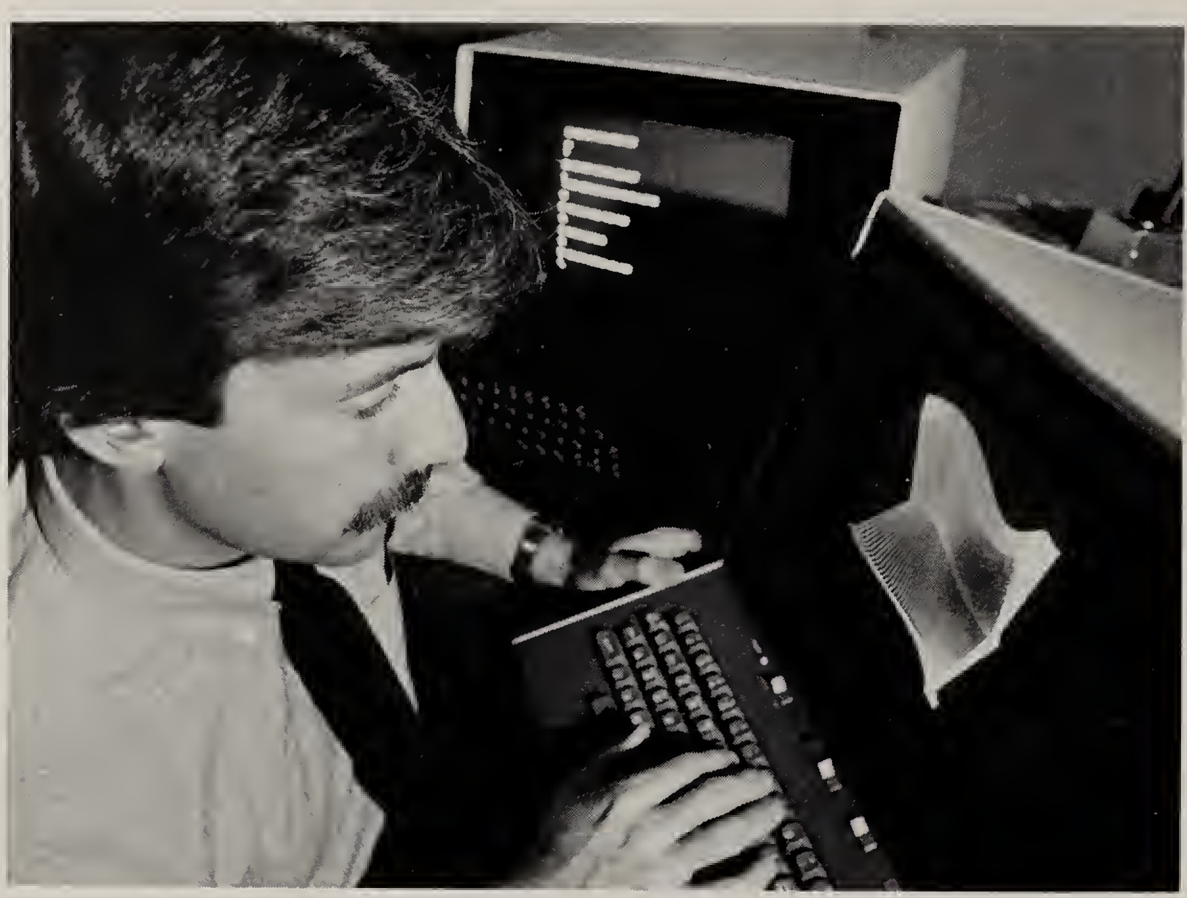
"The reason that stress analyses are important for both cemented and cementless devices," says Dr. Andriacchi, "is that stress placed on bone from walking or climbing is very high, high enough to fracture high-strength, stainless steel implants. With every step you take, you're probably exerting a force on the head of your femur four or five times your body weight. Just walking may cause stress three or four times the weight of your body on your knee joint. When you start running or climbing stairs, the stresses are much higher."

In the early days of joint replacements, these forces were not expected, and many components in artificial joints broke. Today the strength of the materials has been enhanced, and they're strong enough to withstand the forces of movement. Now the problem is making sure whatever fixative is used is strong enough to withstand those same forces. "The first step in figuring out what kind of fixative to use is to know where the stresses are in the joint in question," says Dr. Andriacchi.

Mathematically, it's very difficult to do an analysis of something as complex in shape and materials as bone or bone with an implant in it. The researchers, therefore, use what is called a finite element method to break down the bone and implant into simple regions that can be analyzed in a computer.

In previous studies, Dr. Andriacchi and his staff did stress analyses of the implants that were breaking and were able to show why they





Computer generated stick figure of patient's gait is studied by Thomas P. Andriacchi Ph.D., in Medical Center's gait lab.

were breaking and what conditions led to the breaks. They also were able to recommend various ways the joints should or should not be implanted to reduce the risk of the material breaking. More recently, they've done stress analyses to determine how stresses should go from the implant to bone in a cementless device.

"It's important to design a prosthesis so that it uniformly distributes stress out to the bone," says Dr. Andriacchi. "This is even more important when you depend on bone in-growth in a porous material for fixation. If you put too much stress on a bone, it dies. If you put the right amount of stress on it, it becomes strong. If you don't put enough on it, it becomes weak. That's why if you put a piece of metal into bone and all the stress is transmitted to the metal, the bone will disintegrate around that metal. One of the major questions in orthopedics right now is 'how much stress does bone like?'"

Dr. Andriacchi and his staff are trying to answer this question by analyzing implants made of porous materials in dogs to determine where the middle ground is for putting stress on bone.

Many of the studies done in the lab have the input of Rush Medical College students, orthopedic residents, joint replacement fellows, and pre- and postdoctoral mechanical and electrical engineering and bioengineering students from the University of Illinois, who complete their thesis research in the human motion laboratory. The engineers study everything from the basic science of human locomotion to applications in the development of criteria for better artificial joints. Dr. Andriacchi, the Medical Center's first postdoctoral engineering fellow in 1973, says that there are only a handful of such programs in the country and, each year, the National Institutes of Health sponsor the Medical Center as a training site for two graduate engineers.

"It's rare for engineering students to be able to work in a hospital environment with patients who have orthopedic-related problems," Dr. Andriacchi says. "To be able to look at how patients walk or climb stairs through the eyes of an engineer is a tremendous asset in addressing the problems of reconstructing the body. If you think about it, reconstructing the body is an engineering problem."

Also doing research in the lab are joint replacement fellows, orthopedic surgeons learning about artificial joints after completing a residency. The fellowship program not only allows physicians to become skilled at implanting artificial joints, but also to learn the basic science of joint replacement and why some joint replacements work in patients and some don't.

Since all orthopedic residents at Presbyterian-St. Luke's Hospital undertake a research project, each year a third-year orthopedics resident spends six months in the human motion laboratory researching either gait analysis or orthopedic biomechanics. The resident looks at both the biomechanical and clinical sides of a clinical question and is expected to publish at least one basic research paper and one clinical paper as a senior resident.

The most recent of these projects involved an orthopedic procedure called a high tibial osteotomy, a method of treating an arthritic knee when only one side of the knee is affected. Less severe than a total knee replacement, the procedure involves taking out one

"With conventional treatment, ligaments don't always heal properly. Sometimes you have to make new ones."

Glenn C. Landon, M.D.

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wedge of bone to realign the knee, thus reducing the stress on the arthritic compartment. Gait lab instruments can measure whether or not forces are, in fact, reduced in that compartment, and researchers have been collecting data on this procedure for three years. Resident Chad Prodromos, M.D., compared this gait data to patients' x-rays and clinical findings. The results indicate that gait data can predict which patients will do well with a high tibial osteotomy and which won't, based on how they walk preoperatively. Dr. Prodromos is currently preparing a paper on this subject for publication.

Periodically, Rush Medical College students also complete projects in the lab. Recently, third-year student Gary Kramer, who plans to be an orthopedic surgeon, took a year off from medical school to study sports-related injuries, a project which resulted in a paper he presented in February at a national meeting of the Orthopedic Research Society.

Kramer's project involved a study of forces on the knee joint during running and pivoting activities. Most of the sports-related studies in the lab focus on the knee because, according to Dr. Andriacchi, reconstructing a damaged knee for an athlete is the most prevalent, unsolved problem in sports medicine. More specifically, he points out, it's the anterior cruciate ligament that causes about 80 percent of the problems in athletic knee injuries.

A ligament is the tough, fibrous tissue that connects bone to bone. In the knee, the anterior and posterior cruciate ligaments cross the joint like an "X," and the knee becomes non-functional if these ligaments are ripped away from the bone. The sports and fitness boom of recent years has spurred an increase in such injuries, particularly among the estimated 39 million Americans who play football or basketball.

Gait lab researchers tested the walking, running, climbing, descending, and pivoting abilities of athletes known to be missing this ligament. Kramer tested these skills in a normal population, something no one else had ever done. The study showed that while people missing the anterior cruciate ligament were able to do these movements, they did them differently than a normal population.

The main difference was in the pivoting movement. Tests of players running in a straight line, then pivoting ninety degrees (a "down and out" football pattern), showed they pivot at 25 to 30 degrees of knee flexion while the control group did it at 15.

"The hypothesis," said Dr. Andriacchi, "is that the athletes with missing anterior cruciate ligaments are compensating for not having the ligament by using the knee-hamstring muscle. This has led us to some theories about possible muscle rehabilitation. It may be better to teach athletes how to compensate for the missing ligament than try to repair it."

Another aspect of the sports-related studies being done in the gait lab involves using computer models to simulate orthopedic repairs. In February, the gait lab staff won an award from the Sports Medicine Society for one such study—a computer analysis of ligament reconstruction in the knee. A combined study with The University of Chicago, the project involved a mathematical model of the knee developed by Medical Center biomechanical researchers that allows for testing the effects of ligament repair in the computer before it is done on a patient. The study indicated which type of repairs would be successful for particular ligament injuries and which would not.

Replacing Ligaments

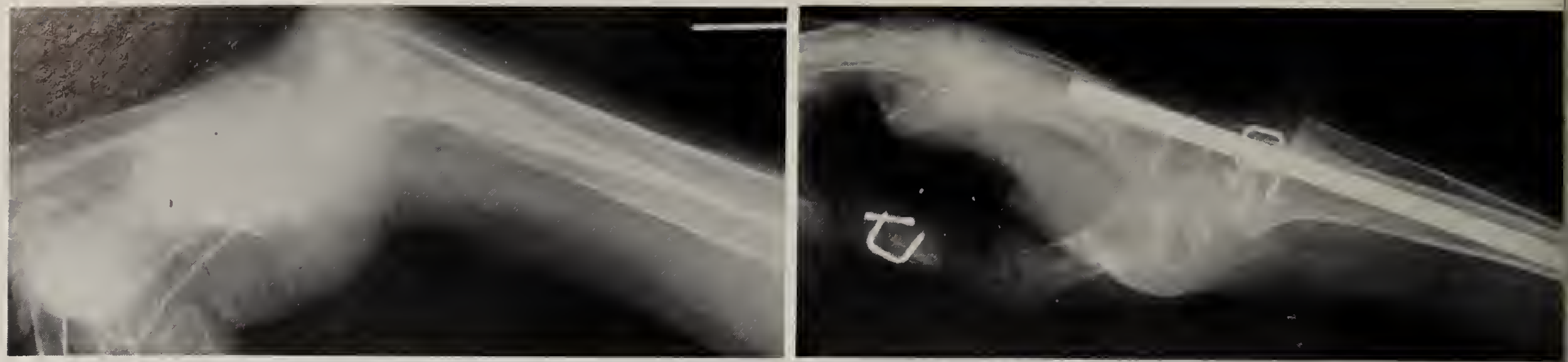
The repair of torn ligaments has long been a problem area in orthopedic surgery. Surgeons usually sew the ripped ends then put the limb in a cast to protect the repair or just put the limb in a cast hoping the ligaments will heal themselves. Because these approaches often don't work, surgeons have been looking at replacement rather than repair as a solution for torn ligaments.

"With conventional treatment, ligaments don't always heal properly," says Dr. Landon, who, with Dr. Gitelis, is co-director of the Sports Medicine Program at the Medical Center. "Sometimes you have to make new ones."

Surgeons have done this by borrowing a piece of tissue from another part of the person's body or by using some other type of material, such as carbon fibers, dacron and other synthetic materials, or cow ligaments.

"These materials are now being tested clinically," says Dr. Landon, "but it remains to be seen which material will be most successful. It's a difficult engineering problem to develop a strong, wear-resistant material that's compatible with the body environment to be used to replace a ligament."

For the last year-and-a-half, as part of an experimental project, Dr. Landon has replaced torn human ligaments with cow ligaments. About a dozen such operations



(Left) X-ray of arthritic hand and wrist. (Right) Hand after fusion at thumb and wrist with metal rod and staples and knuckle joint replacement surgery.

have been performed, usually on the torn anterior cruciate ligament of a young, athletic patient. Thus far, these patients seem to be doing well with their cow ligaments, but, like cementless prostheses, time is the key test for this new approach.

"We need to see how they're working five years from now," Dr. Landon says, "but I think the future of ligament replacement looks promising. If the day comes when we can routinely replace rather than try to repair an injured ligament, then we hope patients can avoid the lengthy recuperation period they need now with the more conventional procedures."

While every orthopedic patient requires physical therapy for a few months, it is a particularly long recovery period for those with repaired anterior cruciate ligaments. Surgery puts an injured or diseased limb through considerable trauma. The weeks of immobilization when a limb is in a cast (or being otherwise protected while bone is growing in) cause it to become very stiff. Because patients who have anterior cruciate ligaments repaired often have had both surgery and weeks in a cast, physical therapy can take as long as nine months.

"The name of the game in physical therapy is increasing strength and range of motion," says Kevin Cronin, P.T., director of physical therapy, Sports and Industrial Medicine Rehabilitation Facility. "Patients with repaired anterior cruciate ligaments are given an exercise program which emphasizes strengthening hamstring and quadriceps muscles through isometric strengthening exercises as well as lifting ankle weights through a short arc motion." Gradually, this motion is increased to a complete arc; patients are then tested on the Cybex II machine, a sophisticated piece of equipment to test muscle strength.

The Cybex can help patients with fractured ankles, frozen shoulders, and sprained wrists in addition to those with torn knee ligaments. As an isokinetic type of exercise equipment, it has variable speeds. Patients progress from the faster speeds where they don't produce as great a force to the slower speeds where, as their strength increases, they can. Like cheerleaders determined to prod their team to victory, the clinic staff gets patients to push their hardest to develop their muscles. When patients can work through a full range of motion, they're tested and the injured limb is compared to the uninjured limb. Progressive resistance exercises continue until the injured limb reaches a functional level within ten percent of the uninjured limb.

The clinic treats a wide variety of patients, from University of Illinois at Chicago basketball and hockey players, to elderly people recovering from sprains. "An athlete should obviously be at a higher level of fitness than the normal population," says Cronin. "If we have a 70-year-old woman recovering from an ankle sprain and an athlete recovering from a torn ligament, we will push each to his/her limit, but the rehabilitation goals will clearly be quite different."

Although it is not recommended for patients with healing ligaments, another form of therapy, manual therapy, is helpful for many patients, especially those with allografts or bone fractures which have been in casts for several weeks. "When a limb is not used for an extended period of time," says Cronin, "the tissues around the joint contract causing stiffness and decreased range of motion. Manual therapy involves a therapist moving the bones on one another to help stretch the soft tissues that hold the joint together. But this type of bone movement could jeopardize the surgical repair of a patient with a healing ligament."

One of Dr. Gitelis' patients, a suburban teenager, recently had the upper third of his humerus (the bone that extends from shoulder to elbow) replaced with an allograft. Through a comprehensive physical therapy program, including manual therapy, he regained 75 to 80 percent of his full range of motion in four months.

"The reason it takes so many weeks for normalization, even with a non-ligament injury, is that the tissues are elastic," says Cronin. "After 15 or 20 minutes of manual therapy, the joints will be loosened up quite a bit. We may stretch the tissues out to regain ten degrees of lost motion, but then they contract and by the next clinic visit the patient has lost eight of those degrees again.

"More and more, orthopedic surgeons are having their patients come in for physical therapy before surgery to build up their muscles," Cronin says. "If patients' bodies are in better shape before surgery and the weeks of muscle inactivity that follow it, then they won't have as far to go to recover their physical abilities afterwards."

Rush's "Bionic Woman"

Russie Berndt is a woman with a rebuilt body.

Since May, 1981, Dr. Shapiro has replaced Berndt's hip, wrist, and six finger joints with steel or titanium implants, and Dr. Landon has given her an artificial elbow. By the time the doctors are finished, she should have six more artificial joints to replace those in her knees, shoulders, and her other elbow and hip.

"Everybody kids me about being a bionic woman," says Berndt, 36, who suffers from rheumatoid arthritis. "They want to know which piece of me is real. I think (the joints) are marvelous. It is truly amazing the difference they have made in relieving pain and letting me get around."

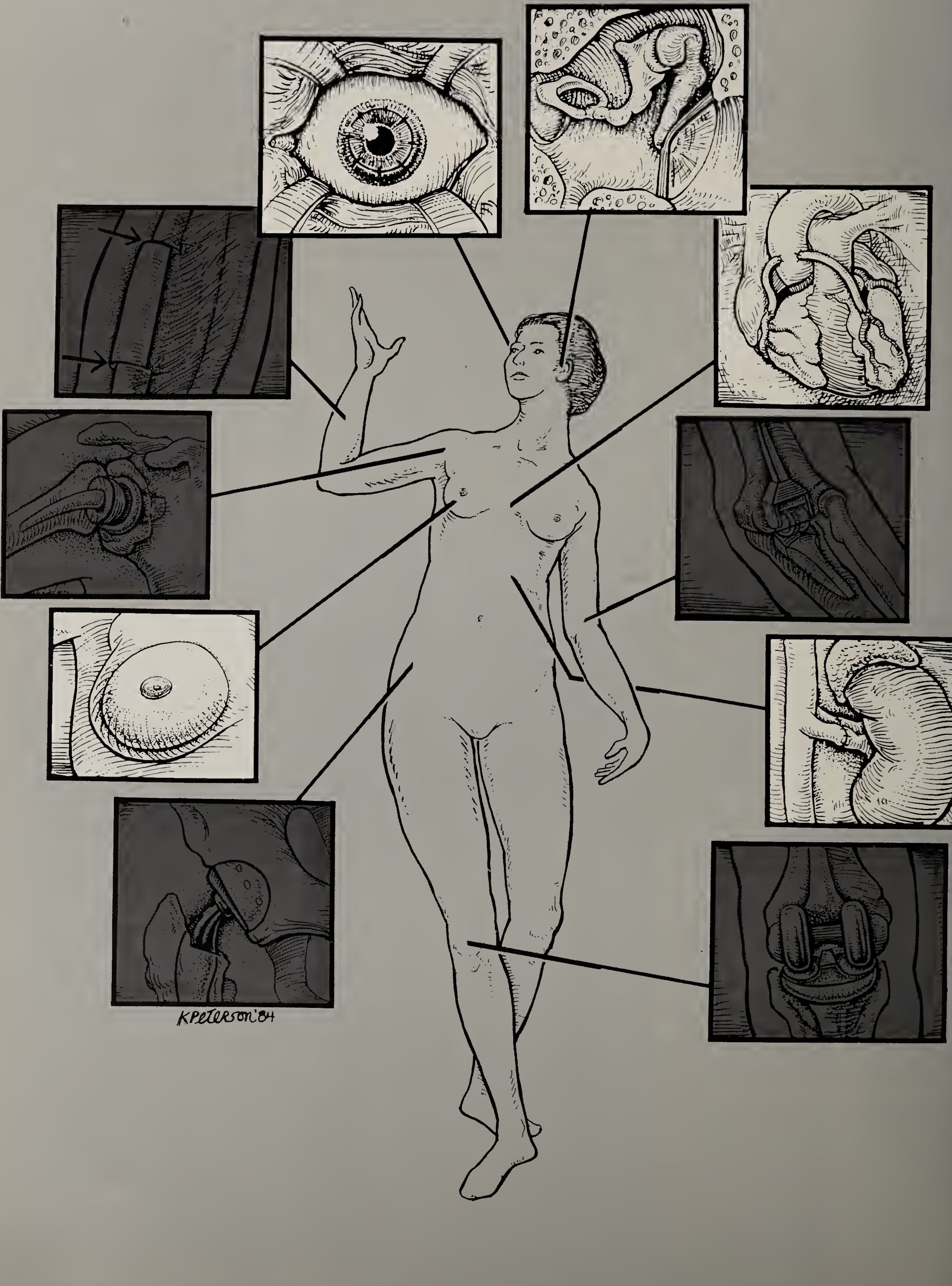
Berndt has had arthritis since she was 11 years old. "During my adolescence, my arthritis wasn't too bad, so I was able to live a fairly normal life," she says. "But by the time I was 30, I was practically bedridden." Before her first surgery, Berndt couldn't climb the stairs to her Skokie home, step up to a street curb, or hold things in her hand.

"The first artificial joint was scary," she says, "but after I saw the results of that one, I was ready to go for another."

The mother of a seven-year old daughter and the adoptive mother of two teenagers, Berndt is not only able now to face the demands of being a divorced parent, but heads the North Shore chapter of an organization called Young Single Parents. "At first I didn't even want to go to the meetings because I was self-conscious about my appearance," said Berndt. "Then I became very involved and couldn't do enough for this group."

Berndt has discussed her surgery on television and encourages rheumatoid arthritics to investigate their options and the new procedures available for them. "People are just amazed when they realize what can be done for rheumatoid arthritis," she said. "I've got a lot of joints to be replaced, and they'll be done slowly but surely. It's like a car. The pieces go, and you get them replaced."

Russie Berndt, the "bionic woman." (Chicago Tribune photo by Karen Engstrom.)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Rebuilders of the Body II

An Overview of Advances and Procedures in Other Medical Center Departments

The ability to rebuild the human body is no longer science fiction. From the top of the head to the tip of the toes, parts of the body are being transferred, transplanted, rebuilt and replanted. Advances in orthopedic and organ transplantation are perhaps most dramatic, but strides are being made in a number of other anatomical areas of the body as well. The following are just some of these areas:

Head and Neck Reconstruction

Whether abnormalities of the head and neck are acquired or congenital—such as cleft lips, birth tumors, birth marks, crushed facial bones and post-tumor cavities—they may require a complicated surgical reconstruction. Cleft lip and palate deformities are now repaired successfully; tumors and birth marks are removed early. Delayed repair of crushed facial bones or deformities in which one side of the face is shaped differently from the other involves the use of bone grafts or synthetic implants.

John W. Curtin, M.D., professor and chairman of the Department of Plastic and Reconstructive Surgery, explains that, increasingly, he is onlaying preformed silicone rubber implants instead of previously-used bone grafts in craniofacial surgery. "I have found that cortical bone grafts (rib) in the reconstruction of the face absorb considerably after a period of years and that onlaying cortical bone grafts over cortical bone does not provide all of the advantages of cancellous bone grafts which pick up a better blood supply from the recipient area. Spongy or cancellous bone (from the hip) derives its effectiveness from the rich supply of endothelial cells which have the ability to form bone, whereas cortical bone grafts do not usually maintain viability."

When synthetic implants are used to repair facial abnormalities, the plastic surgeon works with a prosthetist and artist who first take an impression of the patient's face (a moulage), fill in any of the deficiencies with wax and then make a model of that deficiency with silastic material. This synthetic model is then used by the surgeon as an implant at the time of the reconstruction.

Artificial and synthetic tissues are competing with autologous, homologous and heterologous tissues in all branches of modern reconstructive and replacement surgery. In some patients under certain conditions they seem to function as effectively as "natural" tissues obtained from living or cadaver donors.

Breast Reconstruction

Over 100,000 women in this country will undergo mastectomies this year. A large percentage will be candidates for reconstructive surgery in which a gel-filled, plastic implant is inserted under the chest wall either during the initial surgery or at a later time. Breast reconstruction has been significantly improved recently with better quality, leak-resistant implants and with the practice of inserting implants beneath the pectoralis (breast) muscle rather than in front of it. In addition, a new device called a Radovan expander is reducing the need for the transfer of muscle and skin (latissimus dorsi) from the back to the chest wall. The expander consists of an empty plastic bladder-like implant attached to a thin hose which is inserted under the chest wall. "The expander is periodically injected with a saline solution and over a space of time the skin and muscle in the area becomes stretched enough to reconstruct the breast with a breast implant," explains Dr. Curtin.

The Radovan expander also is being used for a number of other situations which would normally require skin transplants including scalp burns and external ear reconstruction.

Ear Reconstruction

The building of the external ear is probably the most difficult reconstructive procedure confronting plastic surgeons. A person who has lost an ear due to an accident or one born without an external ear can actually have a total ear reconstruction with cartilage from the chest or a preformed plastic framework. The reconstructed ear can be covered with transplanted skin or with skin which has been stretched by a Radovan expander.

Abnormalities within the ear are also being corrected through reconstructive surgery. A common cause of hearing loss is otosclerosis, a condition in which one of the bones in the middle ear stops vibrating because of abnormal growth of bone. David D. Caldarelli, M.D., the Stanton A. Friedberg, M.D., professor and chairman of the Department of Otolaryngology/Bronchoesphagology, explains that, depending on which one of the

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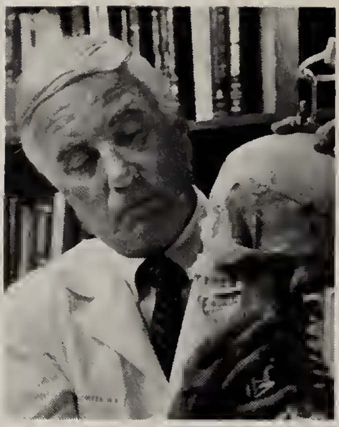
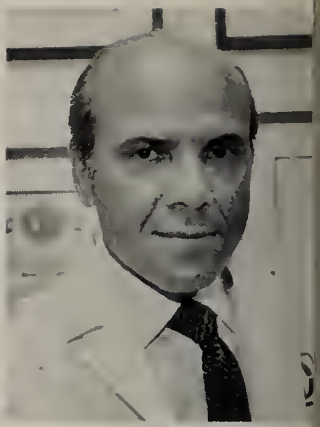
Areas for "rebuilding the body" illustrated on facing page and discussed in following article are eye, ear, heart, kidney and breast.



John W. Curtin, M.D.

David D. Caldarelli, M.D.



Hassan Najafi, M.D.

bones is affected, plastic implants, donor bone or wire can be used as replacements. Eardrums can also be replaced with fascia (the tissue that surrounds muscle), vein grafts, or donor eardrums.

Voicebox Replacement

About half of all patients who undergo a laryngectomy (removal of the voicebox) are able to develop esophageal speech, in which they make sounds by "belching" air with the esophagus. Many of those who are not able to develop such speech, however, can be fitted with a tiny plastic device that is placed within the opening of the windpipe. When air passes through it, it flutters like a set of vocal cords and produces speech sounds. "The quality of the speech is similar to that of esophageal speech," says Dr. Caldarelli. "However, the one disadvantage of the device is that, in order to speak, the patient has to use his finger to plug an opening that is left in the neck." In a number of head and neck cancer cases where the esophagus is removed along with the larynx, a new "esophagus" can be fashioned by stretching the stomach up behind the heart and attaching it to the back of the throat.

Eyes

More than 550,000 cataract surgeries are performed every year in the United States. Until recently, patients who underwent the surgery, which removes a clouded lens from the eye, subsequently had to wear "Coke-bottle" glasses or contact lenses. The glasses provided less-than-optimal vision and contacts were often poorly accepted by the primarily elderly patients. Today, however, approximately 50 percent of all patients who undergo cataract surgery receive plastic lens implants, which are fitted in front of or behind the iris. "Lens implants were first introduced in the mid-50s," says William E. Deutsch, M.D., chairman of the Department of Ophthalmology, "but the lenses were so poorly manufactured that there was a large percentage of complications. They were reintroduced in the late 70s and were popularized after the introduction of better lenses that fit behind the iris."

Corneal transplants, used to replace corneas that have been damaged through disease or trauma, have been performed for 30 years in this country. According to Dr. Deutsch, however, the success of such transplants has significantly increased with the advent of perfected microsurgery techniques. "We have better suture material and better preserving material," he explains. "We now have a preservative that allows cells in the cornea awaiting transplant to remain healthy for 24 or more hours. Several years ago, we had to transplant corneas within 12 hours of the death of the donor."

Although cornea transplants save the vision of thousands of people each year, not enough corneas are available for all the patients who could use them. "We have people on our waiting list now that have been waiting for a cornea since July," says Dr. Deutsch.

Transplantation and Replantation of Hands, Fingers and Toes

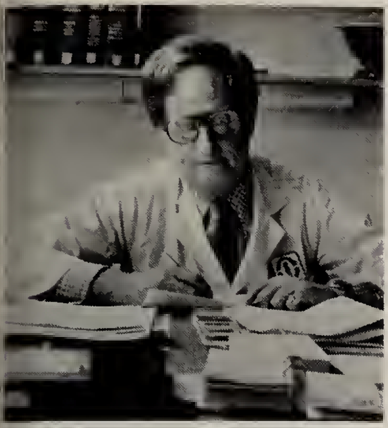
Twenty years ago, a carpenter who cut off his hand with a table saw most likely would have had to learn how to get along with one hand. Severed parts could not survive and function without blood flow and intact nerves. With the advent of microsurgery, however, surgeons can sew nerves and blood vessels back together, making successful replantation possible. Fingers hands, even arms, can, in many cases, be reattached.

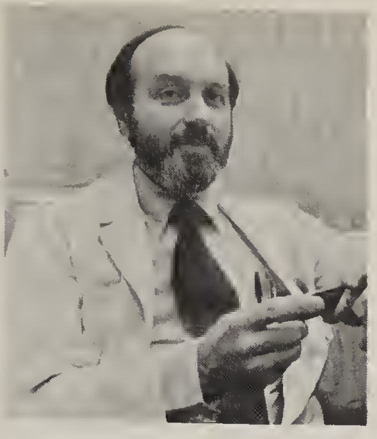
Anastomosis, the surgical attachment or reattachment of hollow structures such as blood vessels, is basic to microsurgery. Robert R. Schenck, M.D., associate professor of plastic and reconstructive surgery, and Harry P. Weinrib, Ph.D., instructor, plastic and reconstructive surgery, have developed an external ring technique for performing anastomoses that promises not only to improve the success rate for these repairs, but also to decrease significantly the amount of time it takes to do them. "It can take 20-30 minutes to do one anastomosis," explains Dr. Schenck. "If one could do each anastomosis in three minutes, the amount of time it takes with the ring technique, that would be a great time-saver in surgery."

The technique involves placing a tiny ring over the end of the blood vessel. The vessel is then stitched with three sutures to the end of another vessel and the three sutures are tied around the ring. If the edges of the blood vessel are stretched, the ring dilates it at the area most vulnerable to blood clots (clots are the cause of many anastomosis failures). The ring also helps to prevent leakage, another common problem in anastomosis. Thus far, the technique has been used with 100 percent success in arteries ranging in size from three to five millimeters in diameter.

Although the first ring used in this procedure was made of plastic, Dr. Schenck and Dr. Weinrib are now in the early stages of developing a bioabsorbable ring made from polyglycolic acid which would dissolve in about 60 days.

Microsurgical techniques have


William E. Deutsch, M.D.


Robert R. Schenck, M.D.

Shahid S. Ekbal, M.D.

also made possible the transplantation of sections of tissue, including blood vessels and nerves. "For example," says Dr. Schenck, "we can take the web space between the first and second toes, including the nerve supply and the blood vessels, and transplant that tissue to the hand. By connecting the nerves from the flap in the foot to the nerves in the hand we can restore sensation to a hand that has lost feeling." Dr. Schenck points out that tissue flaps have been transferred to the hand over a several week period since the early 1900s, but only recently have surgeons been able to reconnect nerves and blood vessels to make it a one-stage operation, greatly reducing hospitalization time.

In addition to replantation of human parts and transplantation of tissue, transplantation of digits is now possible. One example is a toe-to-thumb transfer, in which a patient's amputated thumb is replaced by a first or second toe. Such a procedure typically takes eight to twelve hours, requiring the attaching of bones, arteries, veins, nerves, tendons and then skin.

Muscles can also be transplanted from one part of the body o another. Dr. Schenck was one of he early pioneers in transplanting muscle from the leg to the upper arm, a procedure that restores 40-50 percent of its previous power to he arm without significantly taking away from the function of the leg.

Rebuilding the Heart

Perhaps the most dramatic example of reconstruction of the human body is heart transplantation. The drug cyclosporine, which suppresses the body's natural rejection of foreign tissue, has significantly increased the chances of survival or patients who undergo transplantation of a heart or other organ. Dramatic though they are, heart transplants are still relatively rare, while thousands undergo surgery to bypass coronary arteries, replace valves and patch holes.

Bypass surgery, valve replacement and patch reconstruction are not new procedures, but they are being performed with greatly increased success, thanks to a series of advances in knowledge and technique during the past two decades.

In the mid-60s, for example, a significant number of patients died following heart surgery despite an apparently successful operation. Hassan Najafi, M.D., then a young heart surgeon at Presbyterian-St. Luke's Hospital and now professor and chairman of cardiovascular thoracic surgery, discovered that many of these deaths were due to heart muscle damage mostly at the microscopic level, caused by many factors including electrical stimulation of the abnormally thick heart muscle during surgery. "As a result of this finding and laboratory investigative work," says Dr. Najafi, "surgeons were compelled to prevent this occurrence. Prevention of heart muscle damage during surgery was given the highest priority."

In the early 70s, the technique of locally cooling the heart during surgery was developed to protect against heart muscle damage. Shortly thereafter, another technique was developed which combined local cooling with use of potassium to paralyze the heart, reducing its metabolism to near zero, thereby preserving it and obviating the need for providing it with oxygen. "This was a spectacular development," says Dr. Najafi. "In my opinion, it was the most significant advance in reducing the risk of heart surgery."

Because of these advances, not only is the risk of surgery reduced, but heart surgeons can now perform operations that use to take seven-eight hours in less than three hours. Since circulation to the heart is interrupted and the heart is no longer moving during surgery, the surgeon can see better and sew better.

The development of monafilament suture material has made possible the bypassing of coronary arteries that couldn't have been bypassed ten years ago. "Sutures made with only one filament are almost friction-free," says Dr. Najafi. "The difference is almost unbelievable. We can now operate with much more precision."

A device called an intra-aortic balloon counter-pulsator has saved thousands of lives since it was introduced in the early 70s. When inserted into the aorta, the balloon is synchronized to deflate when the left ventricle contracts, and inflate when the ventricle deflates, thereby assisting blood circulation in the heart and through the body. The device is used to maintain cardiac function in some heart attack patients until they can undergo surgery.

Other advances include improvements in anesthesia, blood banking, heart monitoring and drug therapy to correct rhythm abnormalities and enhance the cardiac pumping mechanism.

Finally, it is now possible to implant an internal defibrillator to protect patients prone to sudden death, secondary to lethal ventricular arrhythmias. With the invention of this device, it can be justifiably claimed that every component of the heart is amenable to repair or reconstruction with anticipated good results.

Urological Implants

Urinary incontinence affects more than eight million Americans. The condition has a variety of causes, including birth defects, complete removal of the prostate because of cancer and neuromuscular problems causing stress incontinence in females. Many adults who suffer from incontinence resort to wearing diapers to prevent social embarrassment. For those who must wear them, diapers are an uncomfortable solution to an annoying problem.

For some sufferers, there may be a better answer. Rush-Presbyterian-St. Luke's was one of two Chicago hospitals that recently tested a new artificial sphincter which appears to reverse incontinence in a large percentage of cases. When implanted, the artificial sphincter closes off the tube through which urine passes out of the body. A small pump also is implanted in the testicles of men or the labia of women. In order to urinate, the individual squeezes the pump, which opens the sphincter and allows urine to flow out of the bladder.

"Artificial sphincters have been available for several years but were mainly experimental. The new implant is more sophisticated and easier for physicians to implant and for patients to use," says Shahid S. Ekbal, M.D., assistant professor, urology.

"It's definitely an advance," he says. "The patient is more in control because the device works more like an actual sphincter." Dr. Ekbal emphasizes that the artificial sphincter is not appropriate for everyone who is incontinent, but for the properly selected conditions it is 80-90 percent successful.

A device that operates on a similar principle is the penile implant, which is used to reverse problems of impotence. An inflatable penile implant produces an erection by means of a pump in the scrotum that forces fluid into the cylinders placed in the penis. When deflated, the fluid is transferred from cylinders to a reservoir and the penis becomes totally flaccid. Semi-rigid prosthesis are non-adjustable in this way. Impotence can be caused by prostate surgery, hormonal imbalances, diabetes mellitus, high blood pressure medication, neurological diseases, circulatory problems, and stress. It's estimated that at least 50 percent of diabetic men suffer from impotence; several thousand receive penile implants each year.

There are many other examples of how the human body is being rebuilt. Paralysis on one side of the face is being corrected by transposing nerves from the opposite side. Large segments of body tissue, including nerves and blood vessels, are being transferred from one part of the body to another. Male and female genitalia can be constructed or reconstructed. Dr. Curtin and James E. Graham, Jr., M.D., assistant professor of obstetrics and gynecology, recently constructed a vagina in an adult woman who had been born without one. Even cosmetic surgery is benefitting from improved techniques. Facelifts, for example, which used to involve only tightening of skin, now tighten facial muscles by resupport of the overlying fascia. Baldness, an age-old-problem for many, can now be corrected with hair transfer, in which flaps of hair-bearing skin are rotated from the front of the scalp.

Human beings are more than a collection of body parts. But when parts of the body are ravaged by accidents, disease or congenital defects, it is not just function, but the human spirit itself, which can be affected. The inner man cannot be disconnected from the outer man. Just ask someone who's had a heart bypassed, or a hand replanted, or a face reconstructed, or an ear rebuilt.

J.L.H.

In Vitro Fertilization: Hope for the Infertile

By Francie Murphy

Although children conceived as a result of in vitro fertilization are commonly referred to as "test tube" babies, their lives are rarely begun in test tubes. Even the term in vitro is a misnomer—it's Latin meaning is "in glass," a product that's been replaced in laboratories by disposable plastics. Usually, the egg is fertilized by sperm in a small plastic dish about two inches in diameter. Only a handful of labs still use test tubes for the procedure. But, however it is done, the moment of conception represents only a small part of the total process leading up to the birth of a baby conceived outside its mother's womb.

At Rush-Presbyterian-St. Luke's Medical Center, in vitro fertilization is the product of a multiple effort by physicians, reproductive biologists, anesthesiologists, and fertility and operating room nurses. They combine forces in the effort to make a dream come true for a sterile woman wanting to bear her own child.

There are four causes of sterility that qualify couples for the Medical Center's In Vitro Fertilization (IVF) Program:

- A woman's fallopian tubes (the site where the egg is fertilized by sperm) may be blocked from disease or voluntary sterilization.
- Her tubes may be absent from birth or as a result of surgery.
- Severe endometriosis (a disease of the uterus) or scar tissue around her ovaries (the site where eggs develop) may be preventing the eggs from being released each month.
- Her husband's sperm count is too low for natural fertilization.

In all four cases, the woman's only hope of conception lies in surgical retrieval of her eggs to be fertilized with her husband's sperm outside the fallopian tubes. The fertilized eggs or embryos are then transferred to the woman's uterus where there's a 20 percent chance they will develop into a successful pregnancy. The success rate for pregnancy by natural conception in any given month also is about 20 percent.

"In vitro fertilization should be a part of any modern university-based fertility center," according to W. Paul Dmowski, M.D., Ph.D., director of the Section of Reproductive Endocrinology/Infertility and professor of obstetrics and gynecology. "It is probably the ultimate step in treating infertility and is medically indicated only in about ten percent of infertile couples," he says.

Some women with a disease of the fallopian tubes, endometriosis or ovulation problems may be helped with surgery or hormone treatments. If a husband's low sperm count is the problem, the couple may choose artificial insemination. That ten percent who may turn to in vitro fertilization, however, could not be helped by any of these treatments. Some one-half million couples across the United States are in this group—couples like Joyce and Kevin Blake, a hypothetical husband and wife we'll follow through the Medical Center's in vitro fertilization program. The Blakes were referred to the IVF program by Joyce's gynecologist at a Chicago hospital. To be considered for treatment, patients can also call directly to Dr. Dmowski or Ewa Radwanska, M.D., co-director, Section of Reproductive Endocrinology/Infertility, and associate professor of obstetrics/gynecology.

In IVF Lab, Rita Basuray, Ph.D., reaches for pipette, used to aspirate eggs from follicular fluid. Note television monitor linked to operating room, at left above.

Prior to enrolling in the program, Joyce's medical history is carefully screened to rule out any diseases which may preclude her from carrying a pregnancy to term. These conditions include diabetes, hepatitis, kidney failure, cancer and heart disease. Prior to the IVF procedure, Joyce will undergo laparoscopy, a minor surgical procedure to determine if her ovaries are accessible through a laparoscope—the thin steel tube inserted into the abdomen to retrieve the eggs. The ovaries also are examined for the presence of follicles which contain the eggs. Any scar tissue covering the ovaries is surgically removed. Women without follicles and eggs cannot be served at this time by the Medical Center's IVF program. They may be helped in the future, however, by the use of donor eggs.

Once accepted into the program, Joyce is instructed to take her temperature every morning before getting out of bed. This basal, or lowest, body temperature will rise at the onset of ovulation. In addition to charting this temperature change, Joyce visits the office of Drs. Radwanska and Dmowski several times prior to ovulation to check the quality of her cervical mucus, another marker of ovulation.

Around the second day of Joyce's menstrual cycle, she begins daily injections of Pergonal to further ensure the development of several follicles containing the eggs. "By stimulating the growth of more follicles, we increase our chances of recovering more eggs," says Dr. Radwanska. Daily blood samples are taken in a nearby outpatient lab to measure the increasing levels of estrogen produced by the follicles. Daily ultrasound tests in an adjacent office mark the growth of the follicles. Joyce's body responds well to the Pergonal and her follicles grow to two-centimeters each in diameter. Physicians can accurately determine the number, size and quality of the follicles using blood tests that measure estrogen levels and by using ultrasound.

"We are using one of the most sophisticated ultrasound machines in the world," says Jason Birnholz, M.D., director of clinical ultrasound, professor of radiology and assistant professor of obstetrics and gynecology. "Using sound waves, our ACUSON machine focuses on a woman's ovaries, while a computer enlarges the resulting picture without losing any detail," he says.

Once ultrasound and estrogen levels indicate her follicles have matured, Joyce receives a shot of human chorionic gonadotropin hormone (HCG) to further mature the eggs. Thirty-six hours later, she enters the operating room where the eggs will be retrieved. The IVF team assembles in an operating room along with a retinue of students. Joyce is given a general anesthetic and her abdomen is filled with carbon dioxide gas to give the surgeons more room to work with their instruments. Dr. Dmowski will perform the laparoscopy assisted by Dr. Radwanska. They exchange roles with each patient.

A small incision is made under Joyce's navel for inserting the laparoscope. Two more small incisions

"In vitro is probably the ultimate step in treating infertility."

W. Paul Dmowski, M.D., Ph.D..

W. Paul Dmowski, M.D., Ph.D., and Ewa Radwanska, M.D., study x-ray of fallopian tubes of infertile patient.

are made below the naval to insert grasping instruments that bring the ovaries within the surgeon's reach. A small needle attached to a thin, plastic tube, or catheter is threaded through the laparoscope. As Dr. Dmowski pierces each mature follicle, a small amount of fluid is drawn up through the catheter and carefully rushed by a medical student to Rita Basuray, Ph.D., waiting across the hall in the IVF lab. Even before she gets the vials of fluid, Dr. Basuray has made some judgements about the maturity of Joyce's eggs.

"From my laboratory, I can watch on the television monitor as the egg is being aspirated," says Dr. Basuray, director of the IVF lab and assistant professor of obstetrics and gynecology. "Being able to see exactly what's happening in the operating room is immensely important. I assess an egg's maturity by the size and transparency of the follicle and, later, by the volume and consistency of the follicular fluid that contains it," she explains. "That way I can determine how much time the egg needs to mature in the laboratory incubator before exposing it to sperm."

Having the IVF lab within a few feet of the operating room will add to the success rate of the procedure, according to Dr. Dmowski.

"We want to get the eggs into the lab as quickly as possible to shorten the time they are outside the body," he explains. "The effect of the external environment may be detrimental and may result in a low rate of embryo implantation." The importance of the lab's location was brought to the attention of Dr. Dmowski and his team during visits to other IVF centers around the world. IVF teams frequently exchange information on improving the quality of the procedure. Several teams have found success using cameras and video monitors in the operating room and IVF lab.

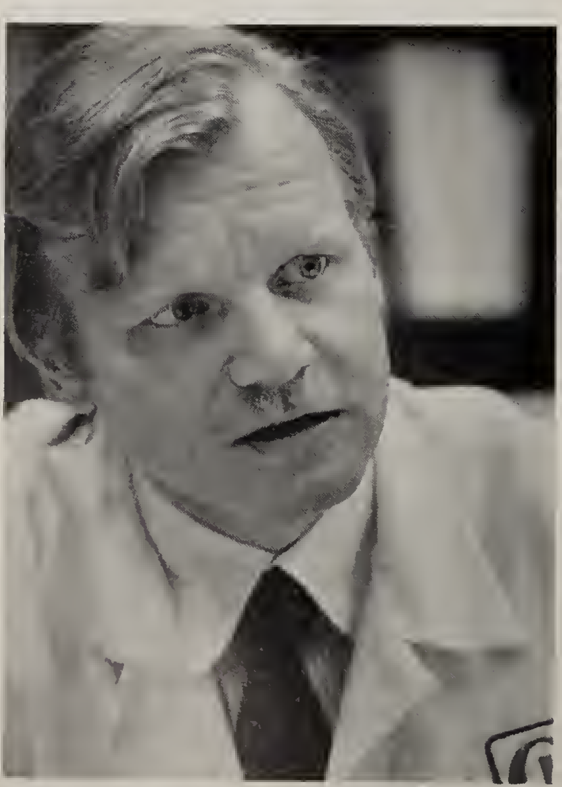
"The monitor allows me to view the egg once Dr. Basuray places it under the lab microscope," he says. (Dr. Basuray can also communicate with the surgeon over an intercom.) "If we can find an egg in that fluid sample," says Dr. Dmowski," we will move on to the next follicle." The surgeon usually flushes each follicle with fluid after the initial aspiration in case the egg was not retrieved on the first try. By being able to bypass that flushing technique with the aid of the monitor, Dr. Dmowski saves valuable time that could affect the survival of the recovered eggs.

"During laparoscopy, the carbon dioxide (CO_2) in the patient's abdomen affects the acidity of the egg's environment. Absorbing too much of the gas may leave the egg unable to divide after fertilization.

"The less time the eggs are exposed to CO_2," he adds, "the greater the chance of a successful pregnancy."

Once the tubes of follicular fluid are brought to the IVF lab, Dr. Basuray places the contents in plastic incubating dishes. All lab dishes, culture medium, and even the surrounding air are maintained at a constant temperature to mimic the eggs' natural environment as much as possible. Each dish is scanned under the microscope to locate eggs which are rarely visible to the human eye. When a dish doesn't contain an egg, the sample is frozen for later investigation. "We want to determine the major components of follicular fluid to better determine if an egg can be fertilized," explains Dr. Basuray.

All eggs retrieved from mature follicles are placed in separate dishes containing a culture medium to ensure maturation. The medium, composed of salt, sugar and human serum (a blood product), mimics the elements essential for growth. The dishes are placed in one of the lab's four, stainless steel incubators where inside temperatures of 37 degrees centigrade are carefully maintained by an electronic warning system. Any variation in temperature sets off an alarm monitored by Medical Center Engineering. When the alarm sounds, Dr. Basuray is contacted immediately. "Quality control in the lab is an essential component of any good IVF program," Dr. Radwanska emphasizes. "Our patients can be assured that every precaution has been taken to safeguard their eggs and developing embryos."



The incubators also maintain constant levels of humidity, CO_2 and oxygen. Thus, the incubators mechanically mature Joyce's eggs preparing them for penetration by Kevin's sperm. About two hours after the eggs are incubated, a fresh semen sample from Kevin is brought to the lab for processing. About 60 to 120 million sperm are present in a one millimeter sample of semen. The sperm are separated from the seminal fluid, suspended in another fluid, and incubated for two to three hours. This step ensures that the sperm will have matured by the time they are exposed to an egg.

Husbands of all women enrolled in the IVF program have their semen analyzed to determine its potential for fertilization. This is necessary to rule out any couple whose infertility problem rests with both husband and wife, since some sperm abnormalities can't be treated.

"Scientists know very little about male infertility," according to Lourens Zaneveld, D.V.M., Ph.D., a male hormone specialist and director of the Medical Center's endocrine lab. "However, we can perform a number of tests on the husband's semen to uncover any problems."

Dr. Zaneveld analyzes semen samples to check the number of sperm, their mobility and shape. He also checks for the presence of male hormones and the ability of sperm to penetrate the egg's surface. "To measure the penetration factor," explains Dr. Zaneveld, professor of biochemistry, obstetrics and gynecology, "we expose the husband's sperm to a hamster egg. They should be able to penetrate the egg, but it won't develop into an embryo," he points out. "That's because the egg's outer layer was removed to let the sperm in. The fertilized egg will not grow, however, when the protective layer is missing and when the chromosomes don't match."

The motility of Kevin's sperm is checked by a post-coital test administered to Joyce 12 hours after sexual intercourse. Doctors check to see if his sperm penetrated the mucus around her cervix at the base of the uterus. The mucus also is checked for the presence of sperm antibodies that would prevent the Blakes from being helped by the Medical Center's IVF program.

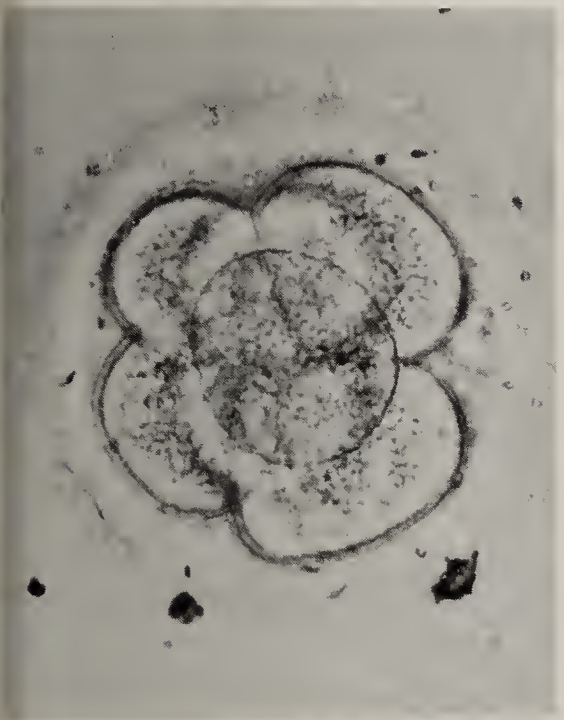
Kevin's low sperm count, though, will not rule out the Blakes. Dr. Basuray will simply need a larger semen sample from him to assure that enough sperm can be separated out for fertilization.

Ironically, this research to improve methods of human in vitro fertilization may lead to better methods of male contraception. "Finding the cause of male infertility may help us develop a way to temporarily halt a man's sperm production—the ideal male contraceptive," say Dr. Zaneveld. "We also hope to develop better methods of diagnosing male infertility and of improving the implantation rate of the fertilized embryo," he says. The low implantation rate is a concern, too, of Dr. Basuray as she carefully prepares to fertilize Joyce's eggs in the IVF lab.

"When the eggs and sperm are removed from the incubators for fertilization about six hours have passed since the egg's retrieval," she says.

Lourens Zaneveld, D.V.M., Ph.D., is currently researching new treatment for male infertility.

> *"Embryos are living things and we are as cautious of them as with other patients. In fact, we are even more cautious because they are not able to take care of themselves. They are innocents in our hands."*
>
> **Rita Basuray, Ph.D.**



Embryo less than two days old.

Each dish containing an egg receives 750,000 sperm and is placed back into the incubator for about 18 hours. The large number of sperm work to clear a pathway for one sperm to fertilize the egg. Dr. Basuray admits to getting little sleep during the time the fertilized eggs are developing into embryos. "I just keep thinking about these little guys and have to make trips to the lab in the middle of the night."

She repeatedly checks Joyce's fertilized eggs to see how fast they are dividing—a sign of new life. Embryos are transferred when they contain four to eight cells.

"All embryos are transferred back to the mother," Dr. Basuray stresses. "These are living things and we are as cautious with them as with other patients. In fact, we are even more cautious with the embryos because they are not able to take care of themselves. They are innocents in our hands."

By the time Dr. Basuray prepares the Blake embryos for transfer, two days have passed since the eggs were first harvested. Joyce is admitted to the operating room as an outpatient and the IVF team reassembles in surgery. Dr. Basuray places the embryos in a catheter that will be inserted through Joyce's vaginal canal, her cervix and up into her uterus. The catheter is carefully rinsed with growth medium to ensure a compatible environment for the embryos. Dr. Basuray deftly fills it with 15 microliters of growth medium, then a pocket of air followed by 25 microliters of growth medium containing all embryos, then more air and tops it off with another 15 microliters of growth medium. The entire mixture is no larger than a tear drop. "Once I get into the OR with the catheter," she says, "it takes less than a minute for the physician to transfer the contents into the womb."

She will take the catheter back to the lab and rinse it with growth medium in case any embryos are stuck to the sides of the tubing. A quick check of the rinse fluid will confirm whether the embryos were successfully transferred. If not, the procedure is repeated.

If the transfer was a success, Joyce, although not anesthetized, is immediately taken to the surgical recovery room. She must remain still in a comfortable position with her knees bent upwards for four hours.

"In this position, gravity is less likely to expell the embryos," explains Dr. Dmowski. "All patients then return home to remain in bed for another day."

One week after the transfer, Joyce returns to the Medical Center for an injection of the growth hormone HCG. Blood samples are analyzed for the presence of progesterone released by the ovary when a fetus is developing in the uterus. After two weeks, if she has not begun menstrual bleeding, ultrasound and blood tests will be done to confirm a pregnancy. "Two

Jason C. Birnholz, M.D., conducts ultrasound test, which provides enlarged picture of woman's ovaries.

> *"The treatment of infertility is a happy specialty, making people's dreams come true and improving the quality of their lives."*
>
> Ewa Radwanska, M.D.

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weeks after conception," says Dr. Jason Birnholz, "ultrasound can see a cavity in the uterus and two weeks after that, it can see a little heart beating."

If Joyce is not pregnant, she has the option of again enrolling in the IVF program. If pregnant, she will be followed by Drs. Dmowski and Radwanska for 12 weeks, then referred to her obstetrician for regular prenatal care and delivery.

Each IVF procedure costs about $5,000. This sum includes all physician fees, ultrasound, blood and semen tests, office visits, IVF laboratory procedures, operating room and hospital costs. Some insurance policies cover part of the bill, but the cost has not been a deterrent to the thousands of couples who have entered IVF programs around the world since 1978.

Over 200 babies have been born worldwide thanks to in vitro fertilization. There are some 50 IVF programs just in the United States.

"Our Medical Center strives for excellence in various areas of patient care," says George Wilbanks, M.D., professor and chairman of obstetrics and gynecology. "Establishing the in vitro fertilization program reinforces our reputation as a major referral center. The commitments made in time, money and personnel prove we want to provide our patients with the best possible program around."

Dr. Wilbanks' enthusiasm for the IVF program is shared by many. One woman whose first IVF attempt was not sucessful told the staff she was still pleased to be a "stepping stone" for others. Another woman was grateful for just being given a chance to have her own baby.

Perhaps Dr. Radwanska best sums up the mood of the IVF team when asked why she chose to specialize in the treatment of infertility some 20 years ago: "It's a happy specialty, making people's dreams come true and improving the quality of their lives. It's intellectually challenging. It's very gratifying. It's an achievement!"

In Vitro Fertilization Laboratory

Dedicated late last fall, the In Vitro Fertilization Laboratory is located in the Medical Center's Surgical Center. It is equipped with the latest technology and includes special equipment for maintaining constant temperatures and a sterile environment.

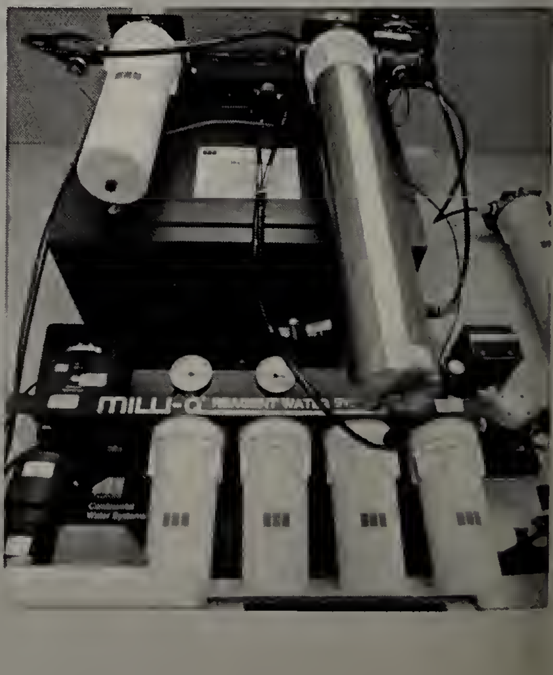
The ivory colored cabinets in the lab contain scores of utensils for mixing and measuring. But unlike the modern kitchen it resembles, everything stored in the lab is packed in sterile, plastic wrap. Beakers and bottles washed in the lab sink are rinsed 13 times, then dried in a small oven. Drying in the open air would expose them to potentially harmful dust. The clean "dishes" are then carefully wrapped in cloth and sterilized before going back on the shelf.

A well-stocked refrigerator contains all the necessary ingredients for a good batch of growth medium and the freezer is filled with serum supplies. Tap water used to make the medium must be run through eight filters, then distilled to remove foreign particles. A small, electronic scale weighs the grains of salt used in the medium recipe. The final product won't be taste-tested, however, but scientifically scrutinized by a Ph meter and osmometer.

A large, color television monitors what is happening in the operating room, not on the networks. Videotape and still cameras are mounted on a special casing attached to the microscopes to provide a permanent record of anything being veiwed.

Four incubators the size of compact refrigerators are stacked in a square. Next to them stand two microscopes under a hood equipped with a special filtration system which keeps air flowing over and around them to prevent dust from accumulating.

As a final safeguard against dust, only two things adorn the lab walls: a hand crafted clock, inscribed with the IVF logo, and a battery-operated dust collector, just in case.



Lab's water filtration systems runs tap water through eight filters.

Epilepsy Treatment and Research

By Janis Long Harris

Every time you go to a movie or sit on a crowded train, there's a good chance that someone sitting near you has epilepsy. One out of every 100 people in this country does. About 75,000 American children and 25,000 adults develop epilepsy every year.

Epilepsy is not a disease, but a condition which takes the form of brief, temporary changes in the normal functioning of the brain's electrical system. The electrical switching process is disrupted by a sudden erratic discharge from a few of the brain's millions of cells. These misfirings can cause convulsions, brief changes in awareness or unusual body movements that are called seizures. Differences in types of seizures depend on where in the brain the malfunction takes place and how much of the brain is affected.

Convulsive seizures are what most people think about in connection with epilepsy. In this type of seizure, the person usually loses consciousness, falls to the floor and undergoes muscle spasms for about two to five minutes.

Non-convulsive seizures may range from brief periods of blank staring, involuntary arm or leg movements or periods of automatic movement in which the individual's awareness of events around him is blurred or absent. These are the most common manifestations of the disease.

Epilepsy can be caused by anything that injures the brain. Some of the more common causes are birth defects or injuries; head injuries from accidents; bacterial meningitis; toxic reactions to drugs or alcohol; brain tumors, clots and infections; poor nutrition; chemical imbalances; and poor blood circulation.

According to Frank Morrell, M.D., professor of neurological sciences, approximately 60 percent of all epilepsy patients can control their seizures totally or partially with medication. In cases where a single, well-localized spot on the brain is the cause of seizures, the condition may be controlled by removing the spot surgically. If epilepsy goes untreated or is inadequately treated, it can get worse. Dr. Morrell's research has shown that epilepsy can spread from a single lesion in the brain to another lesion, called a secondary focus, on the other side of the brain. He is currently engaged in research aimed at finding the best way of preventing the development of an electrical pathway between primary and secondary foci. Until ways are found to prevent the development of epilepsy in the first place, prevention of the spread of epilepsy from one part of the brain to another will do much to control what can sometimes be a debilitating condition.

Surgery Aids Some Epileptics

Nora was 11-years-old when she got into an argument with one of her friends and was hit in the head with a rock. She had emergency brain surgery that same day, but nine months later seizures started during which her teeth chattered and her hands shook. On rare occasions, she would have a generalized seizure in which she fell to the floor and convulsed. Her parents, who took her to a series of doctors, told her she had "something like epilepsy." She didn't know that what she had *was* epilepsy until she was 28.

"When a doctor finally told me I

Frank Morrell, M.D., is researching better ways of preventing spread of epileptic lesions in brain.

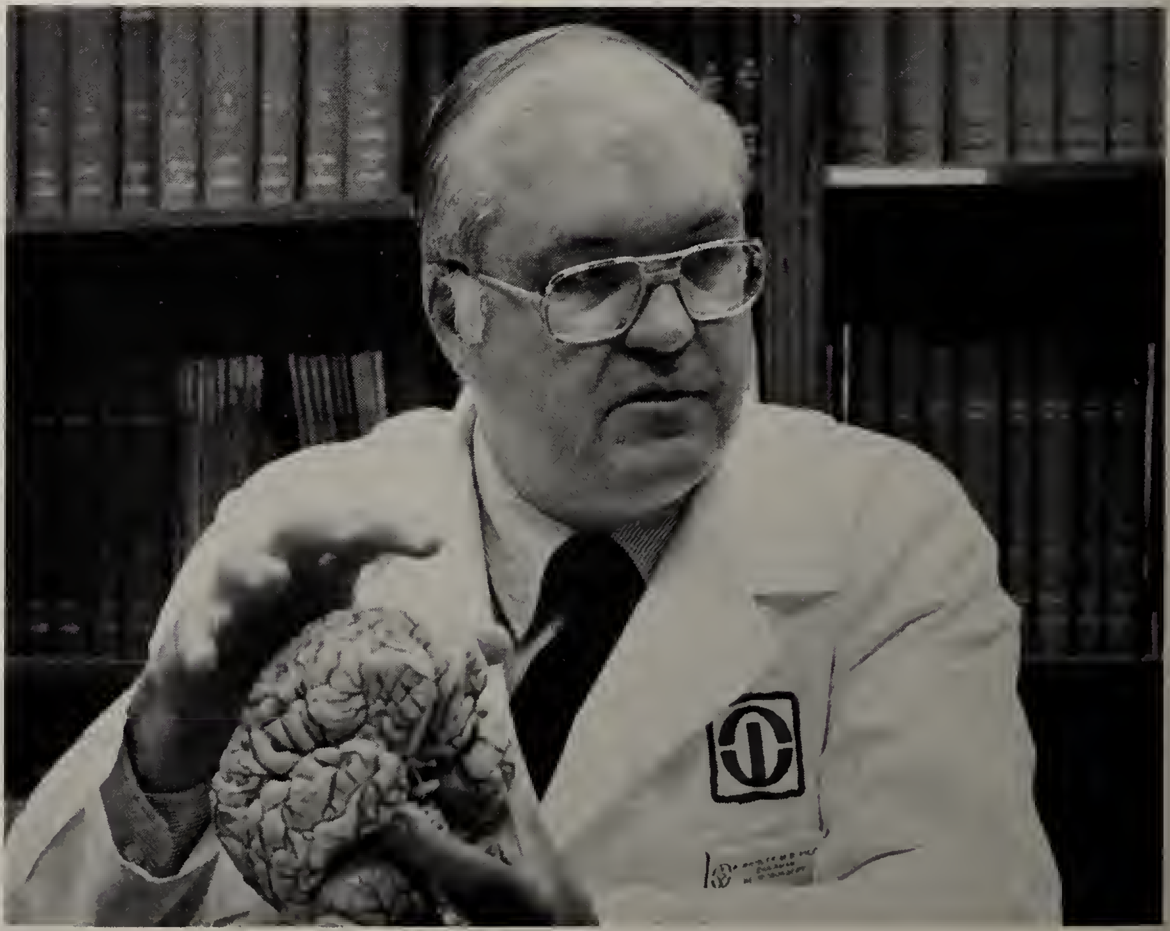
had epilepsy, oh boy, was I depressed," she recalls. "I was one of those people who don't understand about epilepsy and putting a name on it made me feel terrible. All of a sudden, I was one of those *different* people."

Nora had never let her condition interfere with her active life but, as she grew older, she got progressively worse. A filmmaker, she began to dread meetings with clients because she never knew when she might have a seizure. Her memory was so bad that she would forget what she was saying in mid-sentence. After a car accident resulting from a seizure, she had to stop driving. She sought help from a series of neurologists, but nothing seemed to work. Finally Nora was referred to Frank Morrell, M.D., professor of neurological sciences at Rush-Presbyterian-St. Luke's Medical Center, who, after performing a series of tests, informed her she was an excellent candidate for epilepsy surgery.

The surgery took place a year ago. Shortly afterwards, Nora had one last seizure. She hasn't had one since.

"I just had an EEG and for the first time in 24 years there was no sign of epileptic activity," she says. "For all intents and purposes, it's gone."

Nora is one of a small percentage of all epilepsy patients who are candidates for surgery. It's estimated, however, that 25,000 to



Walter W. Whisler, M.D. (shown here), in collaboration with Dr. Morrell, has developed new surgical techniques for epilepsy.

"With our ability to do better mapping, we're operating on epilepsy patients we wouldn't have tried to do before."

Walter W. Whisler, M.D.

100,000 epileptics in this country could benefit from surgical treatment. Even so, only a minority of those who could benefit will actually have the surgery.

"There is only a handful of centers in the United States, including Rush, who offer surgery for seizure disorders," says Dr. Morrell. "That means only 100 to 150 operations for epilepsy can be done per year by all the centers combined. That barely makes a dent."

Although epilepsy surgery is not new, it is extremely delicate, tedious and time-consuming. And, says Walter W. Whisler, M.D., professor and chairman of neurological surgery, "in order to do epilepsy surgery, you need a neurologist who's trained and interested in the treatment of epilepsy, and a neurosurgeon who's trained and interested in the surgical treatment of epilepsy— and the two of them have to work together. That combination is often missing." Also necessary, he adds, are a neuroanesthesiologist and specially trained support staff in a number of other disciplines.

Dr. Morrell and Dr. Whisler have been collaborating together on the surgical treatment of epilepsy patients for some 12 years. During those years, they have been able to put to use a number of advances in diagnostic and surgical techniques. They've also developed some of their own.

Among these advances is a procedure called multiple subpial transection, which Dr. Morrell developed several years ago and which Dr. Whisler has performed in approximately 12-15 cases thus far. One of the most common barriers to epilepsy surgery is a lesion which is located in a vulnerable area of the brain—the one controlling speech or movement, for example. Using standard surgical techniques, the removal of such a lesion would cause an unacceptable level of functional deficit. "But," says Dr. Morrell, "the multiple subpial transection procedure allows us to eliminate the epileptic features of brain tissue without interrupting its capability of carrying out normal physiological function."

Dr. Whisler explains that the abnormal electrical discharge associated with an epileptic seizure spreads out over the surface of the brain. "If the lesion is in an area of the brain that would normally be dangerous, we can cut a grid of little squares about 2-5 millimeters long, as if we were building little fences up and down the cortex. As a result, the discharge can't spread, but the neurological messages needed for normal functioning can filter up vertically. Essentially, you box the lesion in with small cuts."

In order to perform any type of epilepsy surgery on the brain, it's necessary to locate the main focus or lesion. Dr. Morrell and his research associates have developed a number of improved diagnostic techniques which use electrodes to locate precisely the area from which seizures originate. Dr. Morrell explains that an electroencephalogram is used first to try and locate the site of onset.

"If the source is deep in the brain, it may be necessary to put electrodes underneath the skull," he says. "If that is not adequate, we then put electrodes into the brain, aimed at the area where we believe the epilepsy arises, as judged by clinical manifestations."

The availability of improved diagnostic techniques has made surgery an option for more patients. "With our ability to do better map-

Electroencephalogram, in which electrodes are attached to patient's head, helps locate site of onset of epilepsy.

ping," says Dr. Whisler, "we're operating on patients we wouldn't have tried to do before."

In addition to advances in the treatment of epilepsy, advances are being made in understanding the condition itself. Dr. Morrell has been working with animal models seeking answers to questions about how epileptic lesions develop, how they spread in the brain, what triggers their discharge and what are the preferential pathways over which the discharge spreads.

"These are important questions," says Dr. Morrell, "because epilepsy can spread from one point in the brain to another and establish secondary foci which ultimately develop their own epileptic properties. When that happens, the patient will develop another seizure pattern, making treatment much more difficult."

New evidence coming out of Dr. Morrell's research indicates that the development of secondary foci involves protein synthesis and transport of the protein via nerve cell extensions. "If this goes on long enough," he says, "it results in a second epileptic lesion."

Although some medications used to treat the condition help to prevent the spread of epilepsy from a primary focus to a secondary focus, not all do. Dr. Morrell's research is aimed at finding better ways of preventing the spread of epileptic lesions in the brain, thereby making the condition easier to control.

During the past few decades, a number of advances have been made in the medical treatment of epilepsy. Advances are continuing in the diagnosis and surgical treatment of epilepsy. On the horizon is the prospect of greater understanding of the development and possible prevention of a condition that affects two million Americans, maybe including someone you know.

Support Group Aids Epileptics

Perhaps the hardest part of having epilepsy is not the seizures, but the misunderstanding and discrimination of other people.

Susan is a 19-year-old college student who started having seizures when she was a baby. It wasn't until she was five that she was diagnosed as having epilepsy. Although she was put on medication, the seizures continued.

"Sometimes when I was in grammar school I would have a seizure right in the classroom and wet my pants," Susan recalls. "The kids would tease me and I'd come home and cry."

Now that she's older, Susan's seizures are more under control. But she still finds that a lot of people don't understand about epilepsy. Take for example, those people who, because they don't know how to deal with epilepsy, choose not to deal with it at all. "Two years ago," Susan recalls, "I was walking along with a group of girls and had a seizure. When I regained consciousness, there was no one with me."

Because she sometimes has a type of seizure where she loses consciousness, but continues whatever activity she's engaged in at the time, she's concerned about what people will think of her. "I want people to know I'm not some drug addict. I don't want them to think that."

Until recently, Susan tended to keep a lot of her feelings about having epilepsy to herself. Now she shares them with a number of other epilepsy patients who are part of a seizure disorder support group which meets at Rush-Presbyterian-St. Luke's.

"One of the biggest problems of having epilepsy is the feeling of isolation," says Elaine Shepp, M.S.W., A.C.S.W., Social Service Department, who started the support group last April. "The support group can be helpful just because there are other people there who are going through some of the same problems you are."

Shepp explains that her initial focus in guiding the group is to help them to raise self-esteem. Second, she says, "I try to help them to avoid setting themselves up for failure

Support group, directed by Elaine Shepp, M.S.W., A.C.S.W., helps epilepsy patients develop realistic goals.

> *"Epilepsy can spread from one point in the brain to another and establish secondary foci which ultimately develop their own epileptic properties."*
>
> **Frank Morrell, M.D.**

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because of misguided expectations of self or others."

Although Shepp originally had planned for the group to meet for a total of only four weeks, the members of the group liked it so much that she agreed to continue it. Susan is one who is happy that she did.

"The group has helped me a lot," she says. "I've gone through some really stressful times, but I can go to the group and everyone can talk about their problems and we help each other."

Finding a mechanism to help her control stress is particularly important for Susan, who has found that she rarely has seizures anymore except when she's under pressure.

According to Shepp, Susan's experience is not unique. "There is strong evidence that stress can trigger seizures," she says. "As a result, I've begun working with patients on progressive relaxation and imagery techniques to reduce stress. I like to think of it as a maintenance type of thing, not a shotgun remedy."

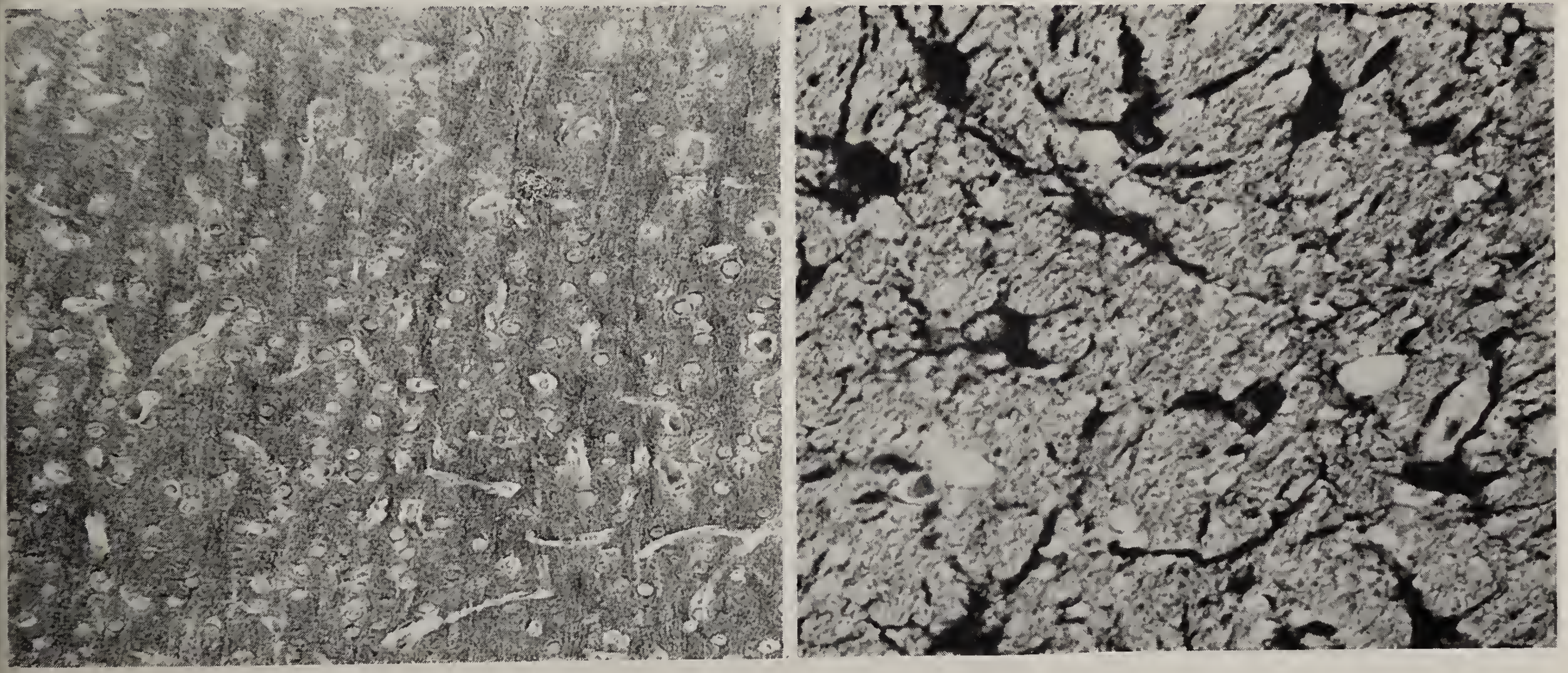
In addition to leading the support group, Shepp also provides epilepsy patients with information about community resources available to them.

Shepp not only works with people who are coping with epilepsy, but, in some cases, with those who have had epilepsy in the past and are now cured—patients who have undergone surgery. "One adjusts to any chronic condition in adaptive and maladaptive ways," she explains. "These adaptations become routine. If you are cured of your condition, suddenly all your responses don't work. There is a complete change in almost every aspect of your life.

"Behaviorists say that people have a repertoire of responses to life situations. The best adjusted people have a large repertoire of responses to change—both physical and emotional.

"I try to help people expand their repertoire."

(Left) normal brain cells; (right) brain with epileptic lesions.



Psychiatry in Thailand

Observations of a Rush Medical College Student on a Year Spent Studying in Thailand

By Krys Kaziezcko-Kuszak

This past fall, Tom Neylan became the first Rush student to receive the Rock Sleyster Memorial Scholarship, established by the American Medical Association's Education and Research Foundation to assist needy and deserving senior medical students who plan to specialize in psychiatry.

Tom has long been interested in psychiatry—so much so that he delayed graduation to allow extra time to explore that interest and get involved in cross-cultural research, which also presented a particular attraction.

At Rush Medical College, it's not uncommon for students like Tom to have an opportunity to explore their diversified interests.

"Rush is always willing to spend time and energy to help exceptional students find non-conventional paths to get where they want to go in their careers—and Tom is an outstanding example," says Ed Eckenfels, assistant dean of academic counseling.

After his second year of study at Rush, Tom, on the advice of his academic advisor, Peter Zeldow, Ph.D., assistant professor, psychology and social sciences, approached the dean's office to discuss the possibility of taking a year off to explore his interests in public health and psychiatry.

"Providing direction for students like Tom is especially challenging and satisfying," Eckenfels says. "It's not like finding a program that's spelled out in the graduate medical education catalog but requires additional work and investigation. Nevertheless, we're pleased to provide counseling and guidance to those students who want to pursue different, less conventional careers in medicine."

Arrangements were made for Tom to join a collaborative research project studying epidemiology in two leprosy settlement villages near Chiang Mai, Thailand, and comparing it with a "normal" Thai village. Funded by the National Institutes of Health to facilitate international scientific exchange, the study included investigators from Thailand as well as the United States under the co-direction of Kenrad Nelson, M.D., and Victoria Schauf, M.D., both professors at the Abraham Lincoln School of Medicine of the University of Illinois.

During that year overseas Tom also initiated two of his own research projects—one on illness beliefs of leprosy patients, and the other, a cross-cultural look at psychiatry (described in the accompanying article). He received financial support from a National Institute of Mental Health stipend that was provided through the Rush Medical College Department of Psychiatry, and a student field experience award from the Department of Preventive Medicine at Rush.

Tom's studies in Thailand added a year to his medical school days; he will graduate in June after five years instead of four but "it was certainly worth it," he says. "Seeing how medicine is practiced in another country and getting involved in public health was a unique experience. Not only would I do it again, but I'd recommend it."

In fact, at this writing, Tom is overseas again, presenting a paper entitled, "Patients' Understanding of Leprosy: A Series of Acute Disorders," at the 12th International Congress on Leprosy in New Delhi, India. While he's there he plans to visit a psychologist at the University of Bihar who is also interested in cross-cultural research, and then make a stop in Thailand for follow-up discussion on the studies he initiated there.

"In Thailand, I learned a lot about how important it is to really listen and take cultural factors into account when you're trying to understand the meaning of what a patient is saying."

Tom Neylan

Theewadaa had been sick for nearly a year. In that time she consulted a variety of health practitioners in her small village in Thailand, including a Chinese herbalist and an "injectionist" who gave shots of western antibiotics and was well known for his healing powers.

But she still felt weakness in her arms and legs and had trouble walking. The tremors continued and there were times when her heart beat so rapidly that it frightened her. She had lost a lot of weight, tired easily and had trouble sleeping at night.

The next step—treatment in a conventional western-style hospital—brought no relief, but one young physician there took note of her symptoms and referred her to Dr. Chamlong, chairman of the Department of Psychiatry at the University of Chiang Mai Medical School 90 kilometers away.

That's where Rush medical student Thomas Neylan saw her.

Neylan spent a year as a post-sophomore fellow studying preventive medicine and psychiatry in Chiang Mai, Thailand. During that time he was involved in three different projects, two dealing with leprosy, a widespread problem in Thailand, and the third, an epidemiology and observation study of psychiatry.

It was while Neylan was studying with Dr. Chamlong, observing his treatments and techniques and attending his lectures, that he met Theewadaa. By that time he had been in Thailand for almost a year and had become proficient enough in the language to conduct medical and psychiatric interviews just as American medical students do during their training.

In his interviews with Theewadaa he learned that the past year had meant a lot of changes for the 53-year-old Thai woman. Her 19-year-old son moved out of the house to another town to work in a hotel. Family ties were important to her and it concerned her too that her mother lived in another town which made it difficult to stay in close contact.

Theewadaa had been married since she was 18. Her husband, like most of the country's population, cultivated rice and also supplemented his income carving teak. Two months after their son left home, he took on a minor wife, a practice that still exists in Thailand.

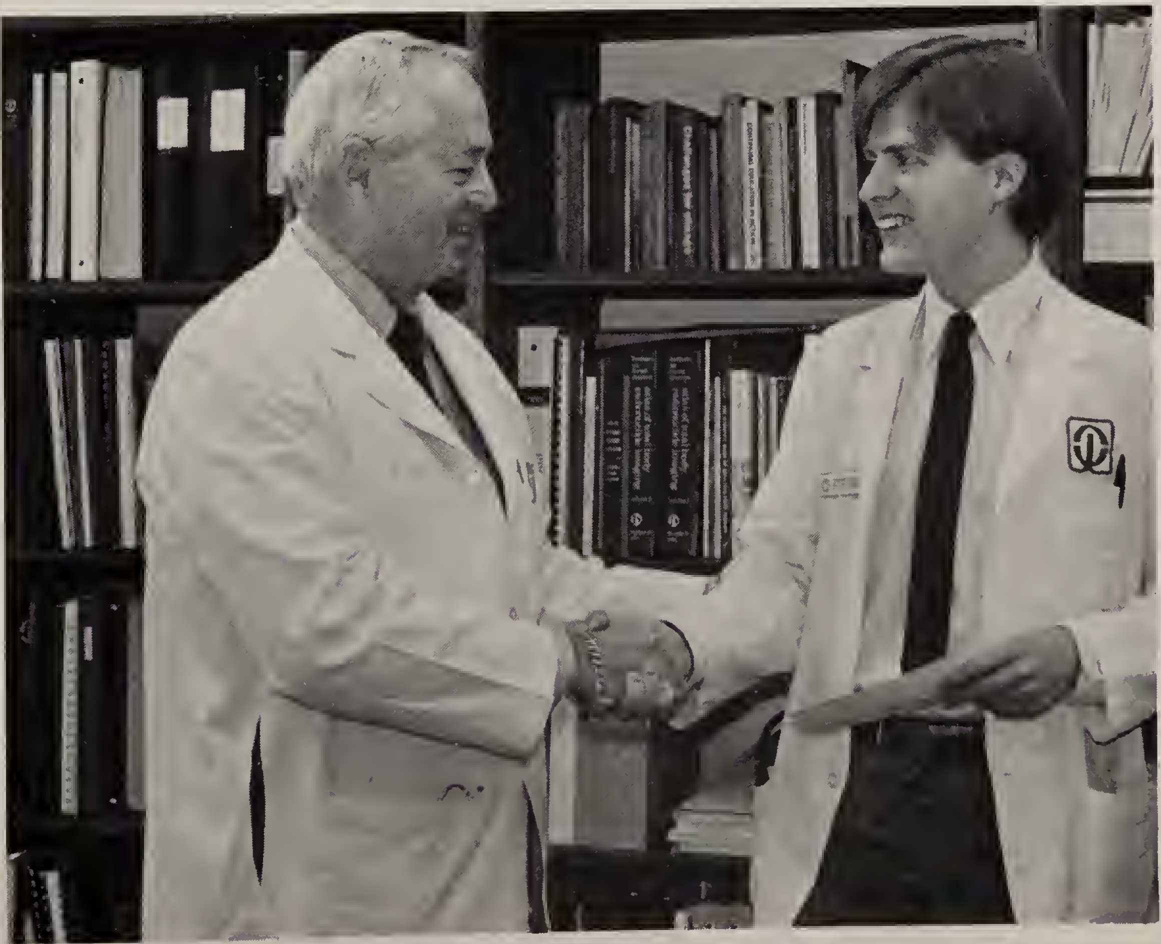
At this time, Theewadaa told Neylan, she found herself feeling equally disturbed and ashamed. She felt that she had failed in life and brought shame upon her mother. But she was unable to express her sadness and began to avoid her friends.

Dr. Chamlong's diagnosis: depression.

"She was telling me she was depressed but only described it in physical terms." Neylan said. "She expressed it as a pressure on her chest and felt that it was a disorder of the wind called rook lom, a Thai humoral category."

"If I asked her about her own personal feelings she would turn away or mention that it wasn't something that should be discussed. She talked about her son and husband but couldn't say how they affected her as regards her feelings.

"It's not that she was suppressing her feelings or denying them,"



Medical student Tom Neylan (right) receives Rock Sleyster Memorial Scholarship from Henry P. Russe, M.D., vice president, medical affairs, and dean, Rush Medical College.

Temple and market place in Thailand. Temples are centers of activities in Thai villages.

Neylan explained. "She really didn't have a vocabulary to talk about feelings. Thai language is much more sophisticated for expressing physical symptoms."

In fact, Dr. Chamlong teaches English psychological terms to patients as well as medical students. Neylan noticed that, in group therapy, patients used the English terminology they learned—words like anger, anxiety, projection, depression and guilt—to describe other patients but many showed difficulty in applying those terms to themselves.

Theewadaa was discharged from Dr. Chamlong's ward after three weeks of therapy sessions and medication for depression. In that time she never acknowledged the fact that she had a mental disorder. Even though she was getting better, she insisted that the psychiatrist and "talk therapy" were doing nothing for her, and she didn't see a connection between being in a mental hospital and having a mental disorder.

Theewadaa's attitude toward psychiatry is not unlike that of most of the patients that the Rush student saw.

"Patients usually complained of physical problems and more or less ignored psychological issues," Neylan said. "Mental illness is very stigmatized in Thailand. The people typically will have first gone to a number of different healers including those who practice with herbal and occult treatments, astrologers and general practitioners at western-style hospitals. A visit to a mental health clinic is a last resort and, after treatment, some patients are not welcomed back home by their families."

In all of Thailand, which has some 50 million people, there are seven hospitals for mental and nervous disorders that provide a total of about 6,000 beds. A number of rehabilitation programs have also been established by the monarchy and the World Health Organization to deal with opium addiction, a major problem.

With a population of 250,000, Chiang Mai is the second largest city in Thailand. Power lines and television antennas are beginning to crop up even in rural areas and concrete structures are becoming more common—both signs of affluence by southeast Asian standards.

But according to Neylan, technology in medicine far surpasses any other form of technology.

The University of Chiang Mai Medical Center boasts sophisticated equipment including CT scanners and automatic clinical chemistries. The medical school there, one of five in the country, has about 150 students in each class of its six-year program. (Students enter medical school right after the equivalent of our high school with the focus immediately on science and medicine-related courses. Liberal arts courses, which American medical students generally take in their undergraduate college days, are not part of the curriculum in Thailand.)

English is the medical language, Neylan says, "and the University of Chiang Mai Medical Center is really modeled after western medicine." Psychiatry, however, is not nearly as well developed as the other specialties, Neylan adds.

Psychiatric care is available at two hospitals in Chiang Mai and Neylan did extensive research at each, looking at the incidence, distribution and treatment of mental illness.

Suan Prung, a government hospital, has 600 beds with male and female patients housed in two different buildings separated by a

Farmer works in his rice paddy in Thai countryside.

corn field and rice paddy. In 1981, as many as 86 percent of the patients there were labeled schizophrenic; 26 percent had lived there for more than five years and many were expected to end up wards of the state. It was staffed by only two psychiatrists, one clinical psychologist and 150 psychiatric nurses.

The Department of Psychiatry at the University of Chiang Mai treats inpatients in a 15-bed ward off to the side of the main hospital building. Dr. Chamlong, who had his training in psychiatry in the United States, is the only psychiatrist on staff. He teaches all the medical students and conducts psychotherapy sessions with each of the patients. While Neylan was there the staff also included five psychiatric nurses, one social worker and an occupational therapist.

Group therapeutic activities were scheduled virtually every minute of the day, Neylan said. There was almost no time when the patient was left alone. Field trips were also planned with outings to parks and, on religious holidays, there were visits to Buddhist temples, which mark the center of activity in each village and define much of the culture.

Patients are handpicked by Dr. Long, who selects them to illustrate different kinds of cases for teaching purposes. As in the United States, psychiatric care is generally available on a fee-for-service basis and is more often sought by those of higher economic status but is certainly not restricted to the wealthy.

In 1981, patients at Dr. Long's clinic totaled 138 and more than half—54 percent—were labeled with various schizophrenic illnesses. That coincides with national studies published in Thailand that indicate a high rate of this emotional disorder characterized by retreat from reality, delusions, hallucinations, ambivalence, withdrawal or regressive behavior. Another 20 percent were treated for substance abuse. Five patients were labeled with depressive neuroses; there were also two cases of homosexuality, which the Thais consider a deviant behavior, and one case of manic depression.

Besides "talk therapy," treatment included a number of psychopharmalogic agents (medications), and electroconvulsive (shock) therapy (ECT) was also quite popular. "The seizure state elicited by ECT is considered desirable by some patients and is actually compatible with some of the indigenous healing traditions in Thailand," Neylan explains. "Some healers go into trance states or semi-convulsions and that in itself is seen as a healing aspect."

The ECT machine is in the general ward setting, rather than in a secluded area as it is in American hospitals. Typically, a patient called in for treatment would first greet Dr. Chamlong with hands folded and a bow of respect. Unlike ECT in the United States, therapy was administered without any muscle relaxants or tranquilizers, but an anesthesia resident was on standby.

Medical students spent four weeks in the ward. During that time they were taught Freudian psychosexual development and were given a series of lectures on basic psychopharmacology. DSM II (the Diagnostic and Statistical Manual, Third Edition), which in the U.S. is considered the "bible" for diagnosing psychiatric syndromes, is barely mentioned, Neylan says. Instead, Dr. Chamlong focuses on a simple psychodynamic formulation for understanding psychiatric disorders—that they are the result of defense mechanisms from problems and frustrations. Within a week students presented cases.

No medical students from the University of Chiang Mai have applied for residency training in psychiatry. However, that is not the case in Bangkok, Thailand's largest city with a census of five million, where the psychological approach toward sickness is becoming more popular, especially among the young and educated.

Neylan himself plans to pursue psychiatry as a specialty and at the same time continue his interest in cross-cultural research. "I'm certainly no authority on psychiatry in Thailand," Neylan emphasizes, "and I can only talk about my personal experiences. But I learned a lot there, especially how important it is to really listen and take cultural factors into account when you're trying to understand the meaning of what a patient is saying." ♔

Rush Rounds

James A. Campbell, M.D. 1917-1983

Memorial services for James A. Campbell, M.D., president of Rush-Presbyterian-St. Luke's Medical Center for 19 years, were held at the Fourth Presbyterian Church, December 7, 1983.

Dr. Campbell died suddenly while visiting friends in Nevada in November. Known for his innovative leadership in medical education and health care delivery, he retired as president of the Medical Center September 15, 1983.

Over 600 friends and colleagues attended the memorial service to share special tributes paid to Dr. Campbell by some of his closest colleagues and friends.

Excerpts from the eulogies delivered at the service include:

Robert J. Glaser, M.D., a long time friend and classmate:

"It is no easy matter to compress into a few minutes the remarkable achievements and contributions that Jim Campbell made to American medicine during his lifetime. That he had the potential for leadership was apparent to all of us who first met him when he transferred to Harvard from The University of Chicago and joined our class as we started our third year. Throughout his career, James Campbell, devoted as he was to medical education, never lost sight of the importance of the patient. His uncompromising insistence that patient care and teaching be melded so that both were of exemplary quality, was, and will remain, one of his greatest legacies."

Mark H. Lepper, M.D., special consultant to the Office of the President:

"Without reservation, I feel that under no other leadership would the resources available at the time Jim Campbell entered the presidency have produced anything remotely approximating the current Medical Center. His goals revolved around the primacy of the patients whose needs included both compassionate as well as technically excellent care. Moreover, the care should be the same for all patients, and all socioeconomic and racial groups should be represented in a 'fair share' manner, i.e., representative of the entire metro Chicago population."

Andrew Thomson, M.D., president of the Medical Staff:

"Dr. James Campbell's relationship to the medical staff, house staff and students was one of teaching by precept, and he would never involve himself in criticism, denigration or character assassination. His attitudes and activities were always supportive and faithful. His tolerance and patience were expressions of his faith in the power of teaching. That faith was inexhaustible. He believed that people could be taught and that they kept on learning."

Harold Byron Smith, Jr., Chairman of the Board of Trustees:

"A few years after Dr. Campbell was named president, I had the privilege of being elected to the Board of Trustees. The momentum of the institution's long history was already accelerating under his leadership. Under his tutelage, I came to understand that history and to appreciate the significance of the great physicians who had guided it and made their inspiring contributions to medicine and to this community. The list is long and impressive. To those and many other distinguished names we now add the name of James A. Campbell, M.D. He meant to take care of patients in the best way his science beckoned, his profession demanded, his talent allowed, and his humanity invited. And he did. Over a span of 35 years, always with a vision of the future, seeing horizons and guiding others toward them."

Donald R. Oder, acting president and senior vice president:

"Dr. Campbell was a physician, scientist, scholar and a superb chief executive but the role he took most seriously was that of fellow employee. When Dr. Campbell was packing his personal possessions from his office after announcing his retirement, he showed me with pride the T-shirts, sweat shirts and warm-up jackets in his office that had been presented by employee sport teams. All the items carried the number '1.' My comment at the time was that with his retirement we were going to retire the number 1 for he was, and always will be, Number 1 at Rush-Presbyterian-St. Luke's."

James A. Campbell was born November 29, 1917, in Mowequa, Illinois. A 1939 graduate of Knox College, he began his medical training at The University of Chicago in 1939 and received his M.D. from Harvard University in 1943. He completed his residency at Boston City Hospital and later was a Harvey Cushing Fellow at Johns Hopkins Medical School and Johns Hopkins Hospital.

Specializing in cardiology, he was the first to perform heart catherization procedures in Chicago. Dr. Campbell joined Presbyterian Hospital in 1948, spent 1952 and 1953 as Dean of Albany Medical College of Union University, Albany, New York, and returned to Presbyterian Hospital upon his appointment as chairman of the Department of Medicine in 1953. After the merger of Presbyterian and St. Luke's hospitals, he was named president in 1964. Five years later another merger created Rush-Presbyerian-St. Luke's Medical Center; at that time the reactivation of the 1837 charter of Rush Medical College formed the basis of Rush University.

A gauge of his effectiveness is a comparison of the institution in 1964 and today. Compared with 1964, Rush-Presbyterian-St. Luke's Medical Center's bed total is fifty percent larger, the medical staff has doubled, the number of residents and fellows has tripled, and the number of employees has risen two and one-half times. D. W.

Elect New Members To Board of Trustees

Seven new Trustees have recently been elected to the board of Rush-Presbyterian-St. Luke's Medical Center. In addition, two new vice chairmen of the Board were appointed.

Named as General Trustees were: Joan M. Hall, Marilou McCarthy Hedlund, Frederick A. Krehbiel, Robert W. Schaefer, and Robert A. Southern; while Robert J. Hasterlik, M.D., Mrs. Edgar D. Jannotta and Harold L. Sherman were named Annual Trustees. Mrs. Frederick M. Allen, immediate past president of the Woman's Board, who has served as an Annual Trustee since 1980, was also elected a General Trustee. In addition, trustees Richard M. Morrow, president of Standard Oil Company (Indiana), and Richard L. Thomas, president and director of First Chicago Corporation, the First National Bank of Chicago, were appointed vice chairmen. They join Roger E. Anderson, chairman, Continental National Bank and Trust Company of Chicago, who has served as vice chairman since 1978.

The following have also been named Life Trustees: John H. Krehbiel, Sr., chairman of the board of Molex Incorporated; Right Reverend Quintin E. Primo, Jr., suffragan bishop of the Episcopal Diocese of Chicago; T. M. Thompson, former chairman of the board of GATX Corporation; Waltman Walters, M.D., emeritus head of the section of surgery at the Mayo Clinic; and George B. Young, former chairman of the Board of Trustees of the Medical Center.

Joan M. Hall is a partner with the law firm Jenner & Block. Born in Nebraska she received her bachelor's degree from Nebraska Wesleyan University and a law degree from Yale University. Ms. Hall was admitted to the bar in 1965 and joined Jenner & Block the same year. A specialist in accountant's liability, securities and general commercial litigation, Ms. Hall was named chairman of the American Bar Association's Section on Litigation in 1982, and inducted that same year into the College of Trial Lawyers.

Dr. Hasterlik is a Rush Medical College graduate of 1938 and an international authority on radiation hazards and atomic energy. He served for three decades on the faculty of The University of Chicago. Until last year he was associate director for the LaJolla (California) Cancer Research Foundation. He is now semi-retired.

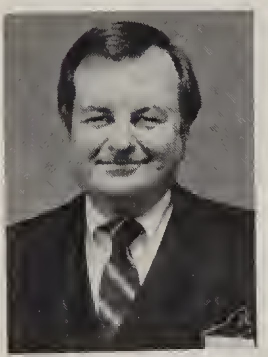
Joan M. Hall

Robert J. Hasterlik, M.D.

Marilou McCarthy Hedlund

Mrs. Edgar D. Jannotta

Robert W. Schaefer


Harold L. Sherman

Robert A. Southern

Ms. Hedlund is vice president of Hill & Knowlton, Inc., a public relations firm, president of Hedlund Properties, Inc., and a partner in Hedlund Real Estate Investments. A 1959 graduate of Barat College, Lake Forest, she received her master's degree in public policy from The University of Chicago. Following a career with the Chicago Tribune, Ms. Hedlund served as alderman of Chicago's 48th ward from 1971 to 1975, as a member of the Chicago Commission for the Study of Rent Controls in 1975, and the Chicago Zoning Board of Appeals from 1975 to 1980.

Mrs. Jannotta is president elect of the Woman's Board of Rush-Presbyterian-St. Luke's Medical Center. A graduate of Smith College, she heads the firm, Interior Decor.

Frederick A. Krehbiel is executive vice president of Molex Incorporated. A graduate of Lake Forest College, he also serves on the board of the Institute of International Education and Illinois Benedictine College.

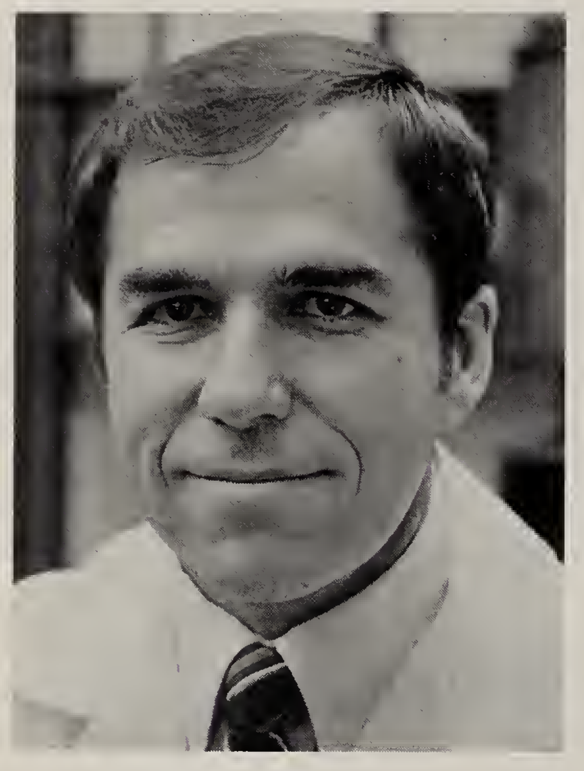
Mr. Schaefer is president and director of Plibrico Company, a privately held firm involved in the manufacture of refractories, boiler settings, furnaces and incinerators. Mr. Schaefer holds a degree in mechanical engineering from the University of Illinois.

Mr. Sherman is president and chief operating officer of United Savings of America. He is also past chairman of the board of Mount Sinai Hospital Medical Center. A native Chicagoan, Mr. Sherman received a bachelor's degree in civil engineering from Massachusetts Institute of Technology and a master's in structural engineering from

Northwestern University.

Mr. Southern is managing partner and a member of the general practice law firm of Mayer, Brown and Platt. A native of Missouri, he received his B.S. and LL.B. from Northwestern University.

P.C.



Roger C. Bone, M.D.

Bone Appointed Chairman of Medicine

Roger C. Bone, M.D., has been named chairman and professor, Department of Internal Medicine, Rush-Presbyterian-St. Luke's Medical Center. The announcement was made by Henry P. Russe, M.D., dean, Rush Medical College, and vice president, medical affairs.

Prior to joining the Medical Center, Dr. Bone was professor of medicine, University of Arkansas for Medical Sciences, and chief, pulmonary division, University of Arkansas Medical Center and Veterans Administration complex. Previously he was associate professor of medicine at the University of Kansas Medical Center, Kansas City.

A native of Little Rock, Arkansas, Bone earned a B.A. degree from Hendrix College and a B.M.S. and M.D. degree from the University of Arkansas Medical School.

Dr. Bone, who specializes in pulmonary medicine, is a recognized authority on critical care medicine and has published over 150 scientific articles and edited five books on respiratory diseases. He is a member of a number of academic and professional societies and the recipient of many academic and teaching awards. Five times at the University of Kansas and the University of Arkansas Medical Center he was named outstanding teacher of the year.

D. W.

Grant to Bowman Center for Eldercare Project

The ultimate goal: To help the elderly maintain their health as long as possible, avoid the need for hospitalization and remain relatively independent in the community.

The method: Eldercare.

Eldercare is now being developed by the Medical Center's Johnston R. Bowman Health Center for the Elderly to provide older people easy access to comprehensive, coordinated, preventive health care and social services. Projected site for the pilot project is Oak Park, Illinois.

Support for the program is provided by a $150,000 grant from the Robert Wood Johnson Foundation for a year of planning under its Program for Hospital Initiatives in Long-Term Care. A "second-phase grant" of up to $500,000 will enable the plans to be implemented.

The Bowman Center was one of only 25 not-for-profit, voluntary or public hospitals around the country to receive funding.

"Our program will focus on assisting the fragile elderly, those with chronic illnesses," says Rhoda Pomerantz, M.D., medical director at the Bowman Center, who is heading the Eldercare project. The emphasis will be on preventive care, and, if it works, fewer of our patients should show up in hospital emergency rooms."

Eldercare is being developed along the lines of a health maintenance organization, with input from the ANCHOR Organization for Health Maintenance. It will feature a single fee structure and single entry point—the Health Access Center—which will be located in the community it is serving.

"We'll be working with and through a community hospital so as not to interfere with pre-existing doctor-patient relationships," Dr. Pomerantz explains. "The Bowman Center will be available for tertiary level care and geriatric expertise."

Social service needs will also be addressed and that's "critical," according to Anna Perlberg, A.C.S.W., director of social rehabilitation at the Bowman Center and a member of the Eldercare planning committee.

"Health and social needs of older people are closely interrelated," Perlberg explains, "but what you usually find are systems of care that provide for one or the other. What makes Eldercare unique is that it will take care of both."

Under Eldercare, each client will have a case manager who will be his/her contact person with the care system. The case manager will make sure that he/she has regular checkups; monitor progress; arrange for needed support services through agencies in the community; provide direct services when indicated; and even serve as an advocate for the client if the need should arise. Care-taking family members will also be provided instruction and support.

The Center for Health Management Studies at the Medical Center will develop, coordinate and maintain a data support system that will allow the case manager to have access to all records and information about the client's current status and care at any time, day or night. A 24-hour hotline will assure that the case manager can be reached in an emergency.

At the end of four years it is expected that Eldercare will have 400 clients. "By that time we also hope to show that it's a program that is fiscally viable and can be duplicated nationwide," Dr. Pomerantz says.

"It's been our experience that the chronically ill elderly often experience a repeated cycle of discharge and readmission to acute care hospitals. It's a cycle that's costly and inefficient and it needs to be broken. Eldercare might be a way to do it."

K.K-K.

Isaac Ray Center Aids Troubled Families

By the time they decided to get divorced, they were openly fighting and screaming in front of the kids, who ranged in age from four to ten.

Both of them wanted to keep the house, so neither would leave. The fighting and screaming escalated. The four-year-old began to have terrifying nightmares. The seven-year-old started wetting his bed. The ten-year-old, who had always been a good student, began having problems at school. Embroiled in their own troubles, the parents couldn't understand what was wrong with their children.

Each year, over one million American children experience the pain of watching their parents separate or divorce. Confused and frightened, these children are all too often the objects of battles over custody, visitation rights, and child-rearing practices. Parents themselves may feel confused, frightened, angry, and guilty. Because the issues surrounding separation, divorce and remarriage are complex, families in conflict often require intervention from mental health professionals who can objectively evaluate the situation, help parents to focus on the needs of the children, and provide emotional support to both children and parents.

In recognition of this need for professional assistance during the divorce and post-divorce period, the Isaac Ray Center, the clinical arm of the Section on Psychiatry and the Law in the Department of Psychiatry at Rush-Presbyterian-St. Luke's Medical Center, recently established the Center for Families in Conflict. The program offered by the center has three components: a child custody evaluation project, a counseling program for divorced families, and a consultation service. Under the direction of Barbara Weiner, J.D., co-director of the Isaac Ray Center, the new program has a multidisciplinary staff of board-certified child psychiatrists, psychologists, and psychiatric social workers.

The child custody evaluation project serves families who are unable to resolve custody or visitation issues without resorting to the courts. "The goal of the program is to provide thorough family evaluations that focus on the needs of the children involved and to prevent further litigation," says Weiner. "We only do evaluations when both sides agree to participate."

Evaluations are performed by an interview team consisting of a child psychiatrist and a psychiatric social worker, with consultations from a clinical psychologist and the center's attorney. Interviews are conducted with each parent alone, each child alone, each child with each parent, and important others. Additional information is obtained from schools, pediatricians and other therapists who have been involved with the family.

"It's a process that can't be hurried," says Robert E. Damptz, M.D., assistant professor of psychiatry and one of seven child psychiatrists who perform family evaluations for the center. "It's a combination of clinical work and social case work. We do a social history, home evaluation and the best basic child evaluation we can. We try not to make just a custodial evaluation, but a child and adult mental health evaluation too. As a result, we often pick up undiagnosed emotional problems."

Dr. Damptz says it is not always easy to decide about custody. "The majority of people we see are acceptable parents, so the considerations are not usually who is the better parent, but what are the child's needs, what is his developmental stage, what is the network around the household and what are the sibling relationships."

As an example, he points out that for the family with three older teenagers and one younger child, the outcome might be different than that for a family with four small children.

When the evaluation has been completed, the team summarizes its findings and develops recommendations about custody, visitation, and, when appropriate, suggested treatment. A conference is then scheduled with the attorneys from each side at which the evaluation team explains its findings and recommendations, and answers any questions.

"In 90 percent of our cases thus far, we've been able to guide the contesting parties to out-of-court agreements which emphasize the children's best interests and which avoid the trauma and costs of a legal battle," says Weiner.

A second component of the Center for Families in Conflict is the counseling program, which provides short-term therapy to families undergoing the stress of separation, divorce or remarriage. The program gives emotional support to both children and parents, and helps parents to work together to meet the needs of their children.

RushRounds

"The transitions involved in the separation of a household can create tremendous emotional and behavioral problems in children," says Virginia Simmons, M.S.W., social worker at the center. "They need their parents' attention most at a time that the parents are least able to give it. They (the parents) get so caught up in the emotions of the divorce situation that they tend to lose their sensitivity to what's happening to their kids."

Simmons indicates the program is trying to work with both parents and children to ease the adjustment to a new lifestyle, with the particular goal of preventing later developmental problems in the children. "We help parents stop focusing on each other long enough to focus on their children," she says.

In addition to its evaluation and counseling programs, the center offers an unusual consultation service for parents who have decided to separate but who want professional advice about the potential impact on their children, about how to tell their children or about how they can be most supportive to their children during this critical period. Center staff meet with parents for up to three sessions to explore the possible problems or benefits of their proposed arrangements in relation to each child.

Because the Center for Families in Conflict is the only one in the Chicago area which systematically addresses the issues surrounding the breakup of a marriage, its future goals include the development of educational and research programs.

Says Weiner, "We've already begun some research on the child custody evaluation process and its effectiveness. In the future, we want to expand the research to find ways to help children adapt during the post-divorce process and then go on to develop an educational program to train mental health professionals in how to conduct custody evaluations and to intervene effectively with families in crisis. The need is great—children are the ones who are most hurt in the breakup of a family, and our children are the future."

J.L.H.

New Equipment for Immunology/Ultrasound

The Medical Center recently acquired state-of-the-art ultrasound and cell analyzing equipment. A high-speed automatic cell analyzer, called a flow cytometer, is now installed in the General Immunology Laboratory of the Office of Consolidated Laboratory Services. Through the use of a laser beam, the new instrument is able to count, analyze and physically separate up to 5,000 cells per second. In previous visual techniques, stained cells on glass slides were studied under fluorescent microscopes. The flow cytometer provides greater speed than is possible with such visual assessment of cells, and makes available quantitative and objective data. The instrument, for example, can scan 10,000 cells and select as few as 50 of a specific type for special examination. The equipment is highly automated and easily interfaces with computers, which can analyze and display data in any of several graphic formats.

By measuring the size and fluorescence of cells flowing single file past an argon laser coupled with a set of sensors, the flow cytometer can analyze up to six characteristics simultaneously. These include, according to the director of the newly established Flow Cytometry Facility, Alan Landay, Ph.D., assistant professor of immunology/microbiology and director of the clinical immunology laboratory, the existence of different antigens on the surface of a cell, cell size, internal structure, DNA content, and stage of a cell's cycle.

The establishment of the Flow Cytometry Facility will help expand the cellular immunology capabilities of the Clinical Immunology Laboratory. The new facility will offer a set of tests which weren't available before, tests that will allow for a more comprehensive evaluation of the immune system in patients with malignancies and immune deficiencies. "For example," says Dr. Landay, "we are now able to provide profiles of monoclonal antibodies which can be analyzed by flow cytometry in order to define particular cell populations."

In addition to its clinical uses, flow cytometry promises to be an important tool in a number of research applications.

"Because the new machine is so powerful and fast," says Frank E. Trobaugh, Jr., M.D., director of the Office of Consolidated Laboratory Services, "significant blocks of time can be identified when it is not being used for diagnostic clinical studies. This means we can make it available as a resource to the medical and scientific staffs—adding to the technology available to investigators in the Medical Center."

Examining results of cell analysis displayed on video screen are (standing) Alan Landay, Ph.D., director, Flow Cytometer Facility, and Robert W. Dickinson, flow cytometer operator.

"The future of flow cytometry is extremely bright," says Dr. Landay. "There are areas of potential usefulness that we haven't even realized yet."

The recently acquired state-of-the-art ultrasound equipment is in the Section of Ultrasound in the Department of Diagnostic Radiology and Nuclear Medicine. The two new Acuson "computed sonography" machines provide greater magnification and better detail than previously available ultrasound equipment, according to Jason C. Birnholz, M.D., professor of radiology and nuclear medicine and director of the Section of Ultrasound. The Medical Center was the first institution in the country to obtain equipment of this kind.

"These machines give very sharp, crisp pictures," says Dr. Birnholz. "As a result, we're getting closer to the goal of doing "biopsies" without the needle. For example, we're finding very small tumors, some as small as one millimeter. We're able to detect fetal abnormalities earlier, and we're able to do some additional fetal measurements to tell us how far along a fetus is."

According to Amy Esposito, chief ultrasound technologist, the new equipment requires a lot more operator skill. "But," she says, "it has superb resolution and brings things out that weren't easily seen with the old equipment."

J.L.H.

Program Aids Performers With Vocal Dysfunction

Singers, actors, politicians, clergymen, trial lawyers, lecturers and radio personalities all have one thing in common—they are each in a profession that relies on the voice.

For them, even mild asthma or bronchitis can cause major problems in terms of their careers. Now they can get help at Rush-Presbyterian-St. Luke's Medical Center where a new treatment program has been specifically designed for those with performing voice dysfunction secondary to pulmonary disease.

"We are not aware of any other program like this in the United States," says Donna Frownfelter, PT, RRT, director of the Department of Chest Physical Therapy and Pulmonary Rehabilitation at the Medical Center. "There is nowhere else that, for example, a singer with mild asthma can go for a coordinated treatment program that includes a medical, vocal and chest physical therapy evaluation; treatments; and a regimen specifically tailored to his needs that he can follow on his own either at home or on the road."

Frownfelter developed the program together with Rosalie Loeding, M.M. An expert on voice technique, problems and disorders, Loeding is a vocal therapist and associate professor of music at Illinois Benedictine College.

The two first met when Loeding, a mezzo-soprano who has appeared in a number of local concerts and recitals, began to have problems with her own voice. She was diagnosed as having mild asthma, a condition which would generally not warrant much concern by the average patient, but the shortness of breath handicapped her as a performer.

Loeding improved with medication and voice therapy, "but it was still not enough," she says. That's when she was referred to Frownfelter, who is editor of the basic text used in educational programs around the country—*Chest Physical Therapy and Pulmonary Rehabilitation: An Interdisciplinary Approach.* (All 12 authors either are or have been members of the Department of Chest Physical Therapy and Pulmonary Rehabilitation at Rush-Presbyterian-St. Luke's, the largest of its kind in the nation.)

It was the addition of chest physical therapy to her treatment that "brought rather dramatic results," Loeding says.

Frownfelter had treated other singers before Loeding—members of Chicago's Lyric Opera, for example—who were able to avoid cancelling performances with the help of the chest physical therapy. "But Rosalie was the first I was able to follow through on a long-term basis, "Frownfelter says. "Her case showed that not only could we treat and help her condition at the time, but that by continuing her regimen she could actually improve her voice and not have the problems recur. She's really been a success story."

That success led the two to co-author an article on their interdisciplinary treatment program in the *Bulletin of the National Association of Teachers of Singing, Inc.*, and since then they've been receiving calls from around the country. One tenor from the New York Opera Company said that he didn't dare let anyone know he had asthma "because if I do, no one will hire me. I'd be considered unreliable."

But Frownfelter and Loeding believe the new program will help to dispel such fears.

Only medically stable patients who have been referred by a doctor are accepted for treatment which is provided either on an inpatient or outpatient basis. Once a patient is admitted to the program, Robert L. Rosen, M.D., medical director of the program and assistant professor, internal medicine, evaluates pulmonary function and medical status. Then Frownfelter shows the patient how to clear out the lungs by postural drainage—getting in a body position that allows gravity to drain out the mucus from the lungs. If the problem is in the lower part of the lungs, for example, a reclining position with the head down and hips in the air helps drainage. She also teaches the patient relaxation and breathing exercises to move the chest comfortably and easily again. Small portable aerosol machines are used to moisturize the air and bronchodilators are added to open up the lungs.

Loeding focuses on "fine-tuning patients as performers." She evaluates their performing techniques, points out and corrects sloppy habits they may have acquired, and outlines a regimen of dos and don'ts for good vocal health.

"Our goal," says Frownfelter, "is, first, to treat patients for their disorders; second, make sure they understand their illness, medication and therapy; and, third, and perhaps most important, teach them how to prevent future problems with their performing voices."

The program is completed in three to five days, depending on the severity of the problem and, if warranted, additional outpatient treatment is provided.

Follow-ups are encouraged either by visit, phone or communication with the client's personal physician who is sent all pertinent medical information and therapy regimens.

To document the effectiveness of the program, Frownfelter and Loeding have initiated a pilot project involving local singers who can easily be followed for a year or two or longer. "This will give us a better chance of observing more closely what's happening on a regular basis," Loeding says.

Audition tapes will be made before and after treatment and then at regular intervals while the singers continue their personal regimen on their own. Pulmonary function will also be tested periodically.

"We know that clinically the program works," Frownfelter adds, "and now we want to measure the improvement scientifically."

K.K-K.

First Art Therapists Finish Rush Program

Through the ages man has used art to communicate—to tell a story, record an event or express an emotion. Recently, art is also being used in the health care field as a diagnostic aid, or to help emotionally troubled patients understand and talk about their problems in a non-threatening way.

"Many emotionally disturbed or physically handicapped people have problems which are so painful they are unable to talk about them," says Barbara DeMarlie, art therapy graduate student, enrolled in an unusual program at Rush University in which art therapy students attend classes with medical students. The program was initiated over a year ago with the School of the Art Institute of Chicago to help postgraduate art therapy students better understand the motivations and dynamics behind their patients' art work.

"To my knowledge, we are the only professional art school in the country affiliated with an academic medical center," says Don Seiden, A.T.R., chairperson, art education/art therapy, the School of the Art Institute of Chicago.

The curriculum offered through Rush University helps the students understand psychiatric problems they will encounter in working with emotionally disturbed or physically handicapped patients.

"Drawing a picture is non-verbal communication," DeMarlie says, "but may be the only way these people feel comfortable 'discussing' their problems. As art therapists, we must be able to use these drawings to help patients begin to discuss their problems."

The students take courses at the Medical Center dealing with psychopathology, treatment options and life crises. In "Development and Life Crises," one of the courses tailored to the needs of the art therapy students, David C. Clark, Ph.D., assistant professor, psychology and social sciences, uses works of art by well-known artists and authors as well as examples of patient art as tools to study human behavior patterns and psychiatric problems.

"Sometimes 'What it feels like,' gets lost in the theory," Dr. Clark says. "I use different art forms—short stories, paintings, films—to teach students theory while keeping them in touch with the feelings and motivations behind the art work."

The combination of art and science broadens the perspectives of both the art therapy students and the medical students in the class.

"Many physicians begin their careers not knowing about all of the therapy disciplines available to help them evaluate and treat their patients. On a practical level, the interaction between the art therapists and the physicians gives them an opportunity to learn about the strengths and weaknesses of each of their chosen fields," Dr. Clark says.

The first class of art therapy students to complete courses at Rush

David C. Clark, Ph.D., and art therapy graduate student Barbara DeMarlie, discuss patients' paintings used for class study of human behavior patterns.

University is now finishing field clerkships prior to graduation in May. Clerkship placements range from general hospitals with psychiatric units and psychiatric hospitals, to rehabilitation facilities, halfway houses, schools and other community-based institutions.

"Some of our students are also interested in going into private practice to help people who are going through temporary life crises," Seiden points out. "Since art therapy can be used to help patients with many different problems in a wide variety of settings, we feel that the courses our therapists take at Rush University will give them a broader base of knowledge to draw upon to help their patients."

M.A.R.

Test New Drug For Tourette's Syndrome

Linda C. was fifteen when her body started to jerk uncontrollably and she began to shout obscenities. For two years Linda was labeled as a troublemaker before being diagnosed as having Tourette's Syndrome, a neurological disorder that affects over ten thousand people in the United States. Often the disease is misdiagnosed as a psychiatric problem.

Symptoms of Tourette's vary from mild, intermittent eye blinking and sniffling sounds, to incapacitating body jerks, and "verbal tics" such as barks, peeps, grunts, squeaks, and curses. Currently doctors do not know what causes this disease and have been controlling the symptoms with tranquilizers, but side effects from these drugs can be unpleasant and include sedation, weight gain, and altered personality.

Physicians at Rush-Presbyterian-St. Luke's Medical Center are testing a new drug that may control symptoms of Tourette's with minimal side effects. The drug is clonidine, a proven treatment for high blood pressure.

"Clonidine may affect the activity centers of the brain that cause the symptoms of Tourette's," says Christopher G. Goetz, M.D., assistant professor in the Departments of Neurological Sciences and Pharmacology, and director of the drug study. "In smaller studies, clonidine has controlled the symptoms of Tourette's with minimal side effects of drowsiness and dry mouth."

The Rush study, which began in December, is the first large scale, double-blind test to evaluate the effect of clonidine on three variables—behavior problems, involuntary movements, and involuntary vocalizations.

Fifteen volunteers between the ages of 8-62 are enrolled in the study for six months. Each will receive the clonidine orally for three months and a placebo pill the other three months. A second group of 15 patients will later be enrolled.

Working with Dr. Goetz are Harold L. Klawans, M.D., acting chairman, neurological sciences; Robert Wilson, Ph.D., assistant professor, neuropsychology; Caroline M. Tanner, M.D., assistant professor, neurological sciences; Susan V. Johnson, M.S., R.N., instructor, medical nursing; Joseph McDermott, M.D., postdoctoral fellow, neurological sciences; Peter Como, M.D., postdoctoral fellow, neuropsychology; and Kathleen Shannon, M.D., neurology resident.

The study is funded in part by a $20,000 grant from Boehringer Ingelheim, Ltd, and is being conducted with the cooperation of the Tourette's Syndrome Association, Greater Chicago Region.

D.W.

Develop Oncology Certification Program

As a result of numerous requests from nurses and nursing students to visit the Section of Medical Oncology at Rush-Presbyterian-St. Luke's Medical Center to observe chemotherapy techniques and the care of cancer patients, members of the nursing staff of the section developed a cancer chemotherapy and care certification program. Established two and a half years ago, the program permits its students to observe, as well as to participate in, the care of cancer patients. There are only some ten programs in the United States offering certification in cancer nursing care.

Nurses enrolled in the two-week program spend 80 hours in medical oncology's outpatient clinic learning how to prepare and administer chemotherapy agents, improve assessment skills, develop effective intervention strategies, and design teaching plans for patients receiving chemotherapy, using appropriate instructional aids. The program's goal is to teach nurses both the skill of administering chemotherapy and the knowledge necessary for optimum care of the cancer patient receiving chemotherapy.

Twenty-five nurses from around the Midwest area have completed the program to date. The medical oncology department at Rush also serves as a resource network for oncology nurses in the Midwest.

Nurses who participated in planning and establishing the certification program at Rush and who currently conduct the program are: Sharon Nisius, M.S., R.N.; Michelle Goodman, M.S., R.N.; Jean Busby Kosova, M.S., R.N.; Josie Howard-Rubin, M.S., R.N.; Rita Wickham, M.S., R.N., and Bonnie Taylor, R.N.

D.W.

Devise New Test For Pancreatitis

Pancreatitis, or inflammation of the pancreas, is a significant health problem in this country. Most commonly associated with alcoholism, it can also be caused by gallstones, abdominal injuries, abnormal parathyroid activity, and excess blood lipids. Because the symptoms of pancreatitis—abdominal pain, nausea and vomiting—are common to a number of illnesses, a laboratory test is necessary to confirm the diagnosis.

The standard test for pancreatitis is an assay for elevated blood levels of amylase, an enzyme produced primarily in the pancreas and salivary glands. Small amounts are also produced in the ovaries and other organs. Most commonly available amylase assays are not specific to the pancreas, however, and tests that can distinguish between pancreatitis and other causes of elevated amylase are too cumbersome for routine use. (Although an elevated amylase level is most commonly related to pancreatitis, it may also be a marker for ovarian and lung tumors). Recently, two investigators in the Department of Medicine at Rush-Presbyterian-St. Luke's developed an amylase assay that appears to overcome both of these problems.

Basing their study on the knowledge that amylase is not just one enzyme, but a whole family of isozymes (enzymes that are chemically different, but whose function is similiar), Donald M. Jensen, M.D., assistant professor of internal medicine, and Vicki Royse, research assistant, devised a method of separating amylase obtained from a blood sample into nine different isozymes. Forty percent of these isozymes are derived from the pancreas; 60 percent are from the salivary glands and other organs.

In the new technique, blood serum is "spotted" onto a clear gel with a plastic backing and an electric current is applied. Because each of the isozymes has a different charge, they migrate differently. When the gel is stained with a blue dye, blue bands appear wherever there is amylase activity. The different locations of the bands on the gel represent different isozymes and allow for a determination of whether they are from the pancreas, salivary gland, ovary or other organs.

"There are other good tests for pancreatitis," says Dr. Jensen, "but this one is at least as good, it's easier, it's cheaper and it gives us double the information."

"The problem in the past has been that the tests that were easy to do didn't give good enough separation of the isozymes, and the tests that gave the best separation were too cumbersome for a clinical lab and were relegated to the research lab," says Royse. "This assay gives a high degree of sensitivity with a test that can be routinely performed."

The investigators have applied for a patent on the technique and are now working on standardizing the procedure and setting it up as a routine lab test. Several related projects have come out of the development of the new test, including an evaluation of patients who undergo an endoscopy (a visual inspection of any cavity in the body with an instrument called an endoscope). Many of these patients develop elevated amylase levels, but it is not known what the direct source of the elevation is. Also being investigated are patients with kidney failure who developed elevated amylase levels.

"There are questions that have been coming up for years that we are now trying to answer," says Royse. "This assay has opened up a very good field."

J.L.H.

Approve Plans for Arthritis Unit

The Medical Center recently approved plans for a new Arthritis Unit to be established at its Sheridan Road Hospital. The center will offer orthopedic, rheumatologic, podiatric and rehabilitative services on an inpatient and outpatient basis, all in a single location. These services will include diagnostic workups, medical treatment, joint replacement surgery, patient education, and physical and occupational therapy, as well as dietetic and social services. "The emphasis of the center will be on comprehensive care and cost-consciousness," says Mitchell B. Sheinkop, M.D., associate professor of orthopedic surgery, one of four orthopedic surgeons who will be staffing the center. "We will be providing arthritis patients with the sophisticated services of a university-based hospital, yet in a community setting. At the same time, care will be provided with an eye toward cost containment."

State-of-the-art laminar air flow equipment will make it possible to perform sophisticated orthopedic procedures, including cementless total joint replacement surgery. The staff of the center, including orthopedic surgeons, rheumatologists, a physiatrist, occupational and physical therapists, social workers and dietitians, will treat arthritis-related problems of the shoulder, elbow, wrist, hand, knee, spine, foot and hip. Patients will be able to avail themselves of the services of the center either by referral from a primary physician or by contacting the center directly.

J.L.H.

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